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From a water color, "T-Wharf"

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H. Armstrong Roberts

BIG POWER

ROAD ENGINES WITH STEAM UP, WAITING FOR THE RUN

The TECHNOLOGY REVIEW

VOLUME 32 · APRIL, 1930 · NUMBER 6

SAILING AROUND NIAGARA

The Great Welland Ship Canal Connects Two Inland Seas

BY JOHN J. ROWLANDS

Editor's Note: Despite the discussion of interior waterways engendered by President Hoover's emphasis on the subject, almost nothing has been said or written about Canada's quiet progress in connecting the Great Lakes with the sea via the St. Lawrence. The Welland Ship Canal is a notable engineering accomplishment, and The Review presents herewith what is believed to be the first comprehensive study of its importance as a link in the inland water routes of North America.

AS A BARRIER to more than 90% of the commerce of the Great Lakes, Niagara Falls will be circumvented this year when Canada completes the great Welland Ship Canal. This new waterway across the Niagara Peninsula between Lake Erie and Lake Ontario will open a vast inland sea and the broad upper reaches of the St. Lawrence River to the great fleet of grain and ore carriers which hitherto have been held to the upper lakes because of the shallow draft of the present Welland Canal.

Completion of the new ship canal, which was started in 1913, and is the most important link in the great highway of shipping that stretches 2,300 miles from the head of Lake Superior to the Gulf of St. Lawrence, will mark the beginning of a new era of commerce on the Great Lakes. The striking significance of this new waterway and its possibilities are best revealed by an examination of the volume of shipping in the upper Great Lakes. It is not generally realized that the Sault Ste. Marie Ship Canals in the St. Mary's River, linking Lake Superior

EAST CHAMBER IN LOCKS NUMBER FIVE OF THE GROUP OF SEVEN IN THE WELLAND SHIP CANAL. ONE OF THE FLIGHT LOCKS, IT HAS A LIFT OF FORTY-SIX FEET, THE GREATEST IN THE WORLD

Ewing Galloway

BUFFALO HARBOR: TYPICAL INDUSTRIAL DEVELOPMENT ALONGSIDE A CANAL. IN THE FOREGROUND ARE IRON ORE DOCKS AND FREIGHT YARDS; IN THE BACKGROUND, A CLUSTER OF IMMENSE GRAIN ELEVATORS

and Lake Huron, carry the greatest fleet of ships in the world, with a cargo tonnage greater by 18,000,000 tons than the combined commerce of the Suez and Panama Canals. In the navigation season of eight months in 1928, a total of 19,286 ships carrying 86,993,000 tons of cargo, moved through the "Soo" Canals. The total tonnage of the Suez Canal for that entire year was 36,050,000; the Panama Canal, with a total of 6,456 ships bearing cargoes weighing 32,950,000 tons, ranked third.

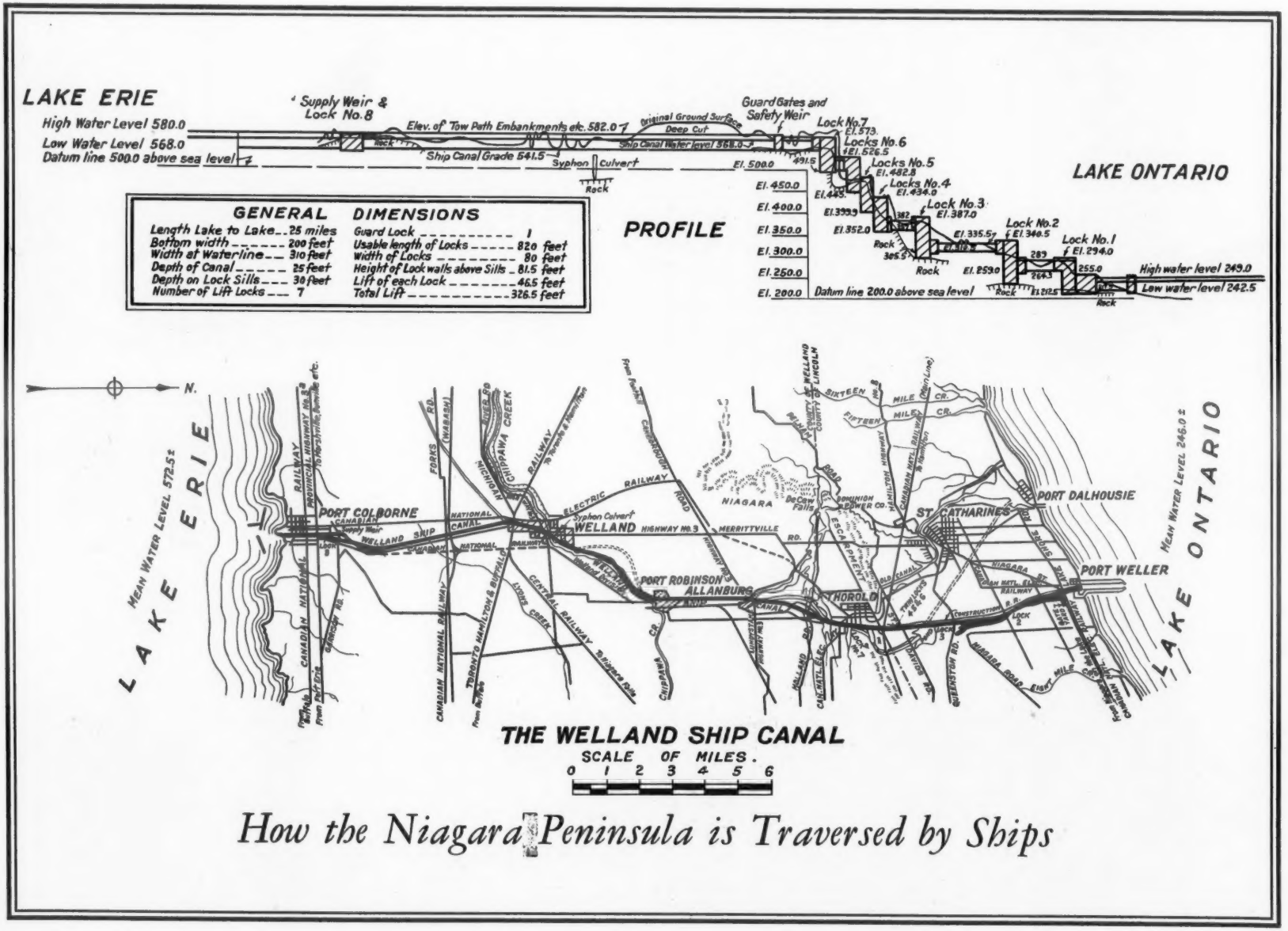
Circumnavigation of Niagara Falls by the largest lake vessels will bring them hundreds of miles nearer the sea, and constitutes an important stride toward the goal of deep water transportation in that section of the St. Lawrence where the canal system now permits the passage of only small vessels of fourteen-foot draft. Here, then, in the riverway lies the last barrier in the projected deep passage from the Great Lakes to the Atlantic seaways. There are two other outlets to the sea. These are the New York State Barge Canal system between Lake Erie and the Hudson River, and the Illinois Canal connecting Lake Michigan with the Mississippi River through the Illinois River. Both these waterways, however, are designed for transportation by barges of comparatively shallow draft.

A. E. Young

A GRAIN-CARRIER PASSING THROUGH THE SAULT STE. MARIE SHIP CANAL

In its total length of 25 miles, the Welland Ship Canal, fourth to bear that name, overcomes more than half the difference in elevation of 602 feet between Lake Superior and the Atlantic. As one of the great engineeering achievements of the time, it is comparable in many respects to the Panama Canal, the locks of which are only slightly larger.

The new Welland Canal has only 8 blocks as compared with 25 in the present canal. Three of these locks are built in flight formation similar to the famous Gatun group in the Panama Canal. Some idea of their size may be gained from the fact that they have a usable length of 820 feet, are 80 feet wide, with 30 feet of water over the sills at lowest lake stages. The locks of the Panama Canal are 180 feet longer and have a greater draft, while the American locks at Sault Ste. Marie have a usable length of 1,300 feet. One of the locks in the new Welland Canal, that into which ships are received from Lake Erie, is 1,380 feet long.



How the Niagara Peninsula is Traversed by Ships

A. E. Young

SAULT STE. MARIE LOCKS NAMED, FROM LEFT TO RIGHT: WEITZEL, POE, DAVIS, SABIN, CANADIAN. MORE TONNAGE PASSES THROUGH THIS CANAL THAN THROUGH THE SUEZ AND PANAMA COMBINED

The outstanding engineering feature of the Welland locks is the remarkably great lift of 46.5 feet, as opposed to 20.5 feet at Sault Ste. Marie, and 31 feet in the Panama Canal. The direct line of the canal down the face of the Niagara escarpment and the topography of the lower plateau permitted the adoption of such high lifts. The twin-flight locks of the Welland Canal have a total aggregate lift of 139.5 feet as compared with 85 feet in the Gatun Locks at Panama. This great lift is well illustrated by comparison with the 158-foot drop of the Horseshoe Falls of Niagara. The wall of one of these locks is 130 feet high and their design has no precedent in chambers of their size. They may be filled in 8 minutes and ships are expected to pass through the canal in 8 hours, as compared with more than 18 hours through the present canal.

The huge lower mitre gates in the locks are 82 feet high, and each leaf in these gates weighs 495 tons. The total estimated weight of the gates, including their fixed parts and operating machinery is 23,000 tons, and the massive gate valves of the regulating weirs are 15 feet long and 7 feet on the face of the Taintor valve. The entire canal will be operated electrically.

Outside the locks the canal prism (channel) will be 300 feet wide at the water line sloping to a width of 200 feet at the bottom. The uniform draft will be 25 feet, but as all locks and other masonry structures are built to allow an ultimate deepening to 30 feet at low water, the canal could be quickly brought to that standard by dredging the channel prism and harbor approaches.

At Port Weller, the Lake Ontario entrance to the canal, an artificial harbor was created by the construction of two embankments extending into Lake Ontario for a mile and a half, to provide a haven of 150 acres. The canal enters Lake Erie at Port Colborne, where it joins the line of the present waterway. Its construction has involved the excavation of 8,961,000 cubic yards of rock, and 50,731,000 cubic yards of earth. Watertight embankments containing 4,771,000 cubic yards were built, and into the forms for the great locks and other structures, 3,516,000 cubic yards of concrete have been poured. In this work more than 28,700,000 pounds of reinforcing steel were required.

LOWER ENTRANCE ON LAKE ONTARIO LOOKING SOUTH-EAST, TO LOCK NUMBER ONE OF THE WELLAND SHIP CANAL

THE Welland ship canal is the fulfillment of a dream which began to take form when the French explorers of the Seventeenth Century penetrated the mid-continent wilderness to the Great Lakes and saw in these vast inland seas, not only an opportunity for further adventure in an unknown land of high promise, but the possibilities of developing new paths of commerce in trade with the Indians. How quickly those pioneers grasped their opportunity is indicated in the fact that a trading post was established at Niagara as early as 1720, and that in the year 1721 there was the beginning of "a great trade with the Indians upon the Great Lakes." Cadwallader Colden, in his "Memorial Concerning the Furr-trade of the Province of New York" presented to Sir William Burnet, Captain-General and Governor of the Province, in November, 1724, directed attention to the water-carriage between the St. Lawrence River, the Great Lakes, and the Mississippi River, with short portages between them.

The importance of transportation has been strikingly demonstrated in the economic development of the Great Lakes region. For a time the early voyagers who brought rich cargoes of furs out of the wilderness were content to carry their birchbark canoes over the portage which separated Lake Superior and Lake Huron, and again across

the peninsula between Lake Erie and Lake Ontario. Beyond lay the rapids of the great St. Lawrence, rugged barriers in this great waterway to the sea.

To that gallant band of adventurers, of which the Northwest Fur Company was composed, must go credit for the first step in improving the transportation routes of the Great Lakes. This was begun in 1796, when a small lock was built to overcome the swift descent of the St. Mary's River at Sault Ste. Marie between Lake Superior and Lake Huron. Within two years after the undertaking was started, the big birchbark freight canoes of the company's rapidly growing fleet were passed from one lake to another without disturbing their valuable cargoes of fur. This step opened a trade route unbroken by portages from the head of Lake Michigan and Lake Superior, through Lake Huron, the St. Clair, and Detroit Rivers, and Lake Erie, to the brink of the great falls of Niagara, known at one time as Jagara. At this point travelers faced a long portage to Lake Ontario.

A. E. Young

PUSHING THROUGH THE "SOO" BEFORE WINTER CLOSES THE CANAL

As early as 1710, Clerambaut d'Aigremont, a special agent of the French Government, traveled through this country, and in making report to Louis XIV, said: "When I passed the portage at Niagara it did not appear to me that any communication between Lake Ontario and Lake Erie could be made that could avoid this portage, and if M. de la Mothe (Cadillac) knows a means of doing so, I think he is the only man in the country who does. But, My Lord, even if it were true that a communication with Lake Ontario or Lake Erie could be made, it could only be done with very great expense and it would not follow from that, that Detroit would be able to obtain from Montreal any help it might need in case of war with the Iriquois, for such help could not even be given to Fort Frontenac, which has to be passed through on the way to Detroit."

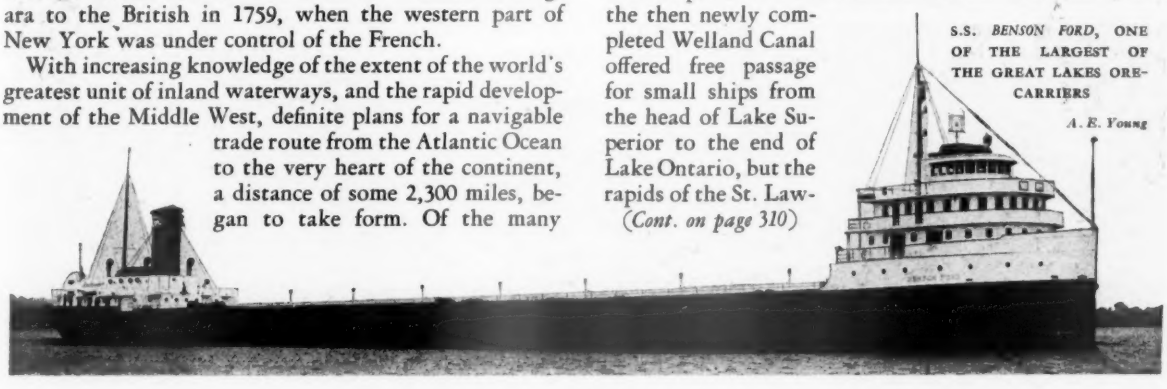
History leaves no record of any attempt to establish a navigable waterway between Lake Ontario and Lake Erie for several decades after the surrender of Fort Niagara to the British in 1759, when the western part of New York was under control of the French.

With increasing knowledge of the extent of the world's greatest unit of inland waterways, and the rapid development of the Middle West, definite plans for a navigable trade route from the Atlantic Ocean to the very heart of the continent, a distance of some 2,300 miles, began to take form. Of the many natural obstacles to be overcome, the thundering rapids of Niagara and the towering escarpment over which the waters of Lake Erie plunged, loomed as the greatest. At this point all freight was laboriously transported overland from Queenstown on Lake Ontario at the mouth of the Niagara River, a distance of some 20 miles to Chippewa Creek which flows into the river above Niagara Falls. Finally in November 1824, a private Canadian enterprise called the Welland Canal Company was organized by the late Honorable William Hamilton Merritt. Then began the formidable task of building a waterway across the Niagara Peninsula, famous as one of Canada's garden spots where vineyards and orchards reach as far as the eye can see.

In 1829 this first navigable waterway between Lake Erie and Lake Ontario was opened for traffic. The significance of that day was increased throughout the years. Then it was that two schooners, a Canadian and an American, sailed into the entrance of the first Welland Canal to the cheers of a great throng of spectators, and passed from Lake Erie to Lake Ontario. This first canal was one of the most daring engineering feats of its day. The difference in elevation between Lake Superior and the Atlantic Ocean is 602 feet, and of this altitude, the Welland Canal alone had to lift ships 326 feet, or more than half the height, crossing a peninsula 25 miles wide and scaling the steep Niagara escarpment at a point some 10 miles west of Niagara Falls.

The original Northwest Fur Company's canal between Lake Superior and Lake Huron at Sault Ste. Marie, and the then newly completed Welland Canal offered free passage for small ships from the head of Lake Superior to the end of Lake Ontario, but the rapids of the St. Law-

(*Cont. on page 310*)



S.S. *BENSON FORD*, ONE OF THE LARGEST OF THE GREAT LAKES ORE-CARRIERS

A. E. Young

THE SICK TEXTILE INDUSTRY

Anachronistic Management and Technique Deprive It of Success

By Hibbard S. Busby

DURING the latter days of the Eighteenth Century, the manufacture of cotton textiles was revolutionized by the great English inventors. Inventing ingenious machinery for which Eli Whitney was to gin cotton and Watt to furnish power, Wyatt, Highs, Hargreaves, Arkwright and their contemporaries ushered in the machine age. In volume, the output of the textile industry forthwith grew enormously, and the example it set of large scale machine production spread quickly to other types of manufacturing.

Hereupon arose a paradox. The industry that ushered in our modern machine era did not keep pace in technical improvements or managerial technique with the other industries which imitated its methods. The American textile industry today, except in size, is not greatly different from the textile industry that the young expatriate Englishman, Samuel Slater, founded in Rhode Island in 1790. True enough, Jenks invented ring spinning and Draper and Crompton improved the loom, but aside from these and a few other exceptions, the industry has attracted appallingly few men of technical genius, and still fewer managers able to apply the principles of scientific management.

Today the industry at large has yet to develop an organized plan for handling research and engineering problems, suffering as it is from the dominance of that cobwebbed system of management which places complete reliance upon a rising price of raw material and a good selling market. Skill in buying and selling raw material, cotton, is usually the determining factor in a plant's prosperity. The textile industry is now the only large industry in the world of which this is true, and herein lies the answer to the often asked question, "Why is the textile industry sick?"

An analysis of this paucity of ability and ideas reveals at once that the structure and organization of a large part of the industry today is such as to ignore the qualities that characterized Arkwright, Jacquard, Crompton and their confrères. It is quite possible to anticipate the protest which such a statement as this will occasion, but when it is considered that the development of the industry has been altogether away from craftsmanship, that it has in large proportion eschewed art and that it has built up no unified supporting organization of pure and applied science, one is inclined to make the statement even more radical and sweeping.

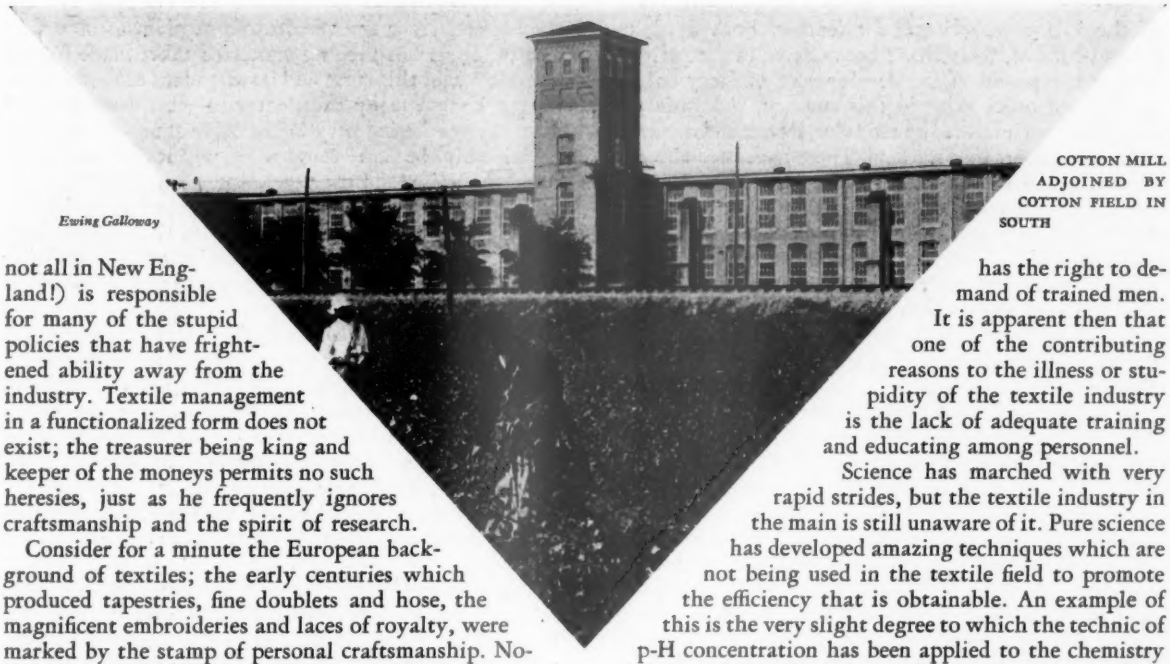
Some one has remarked that New England mill treasurers are born, not made. The divine right of treasurers born to their jobs (and they are

Ewing Galloway

WELL-EQUIPPED TEXTILE TESTING LABORATORY

Ewing Galloway

MODERN SPINNING FRAME IN A WOOLEN MILL



Ewing Galloway

COTTON MILL ADJOINED BY COTTON FIELD IN SOUTH

not all in New England!) is responsible for many of the stupid policies that have frightened ability away from the industry. Textile management in a functionalized form does not exist; the treasurer being king and keeper of the moneys permits no such heresies, just as he frequently ignores craftsmanship and the spirit of research.

Consider for a minute the European background of textiles; the early centuries which produced tapestries, fine doublets and hose, the magnificent embroideries and laces of royalty, were marked by the stamp of personal craftsmanship. Nobody but a simpleton would imagine that the needs of the world today would be satisfied by the same hand production of that period, but even the most casual observer can see that our modern industry is suffering from a lack of craftsmanship.

Back of all these lacks is the training of the personnel. It is to be regretted that such a large portion of time in textile schools, for instance, is spent upon the mere mechanics of cloth structural form and so little time is spent in developing a sense of texture and fine figure. The A. French Textile School of the Georgia School of Technology has already improved its curriculum toward this end and M. I. T. is doing extensive work in the scientific fundamentals of textile engineering. It is not amiss, however, to say that the average textile school has been training good inspectors and foremen, but not engineers and managers who can create and develop. I know of one organization with a world-wide reputation for textile fabrics which has kept careful records of the graduates it has employed from the textile schools. Not a single one of these men has produced even a new fabric or an important new use for a fabric or a marked enhancement in the quality of the fabrics already being made. However useful they may be in filling static positions they do not possess that element which every employer of skill has the right to demand of trained men.

It is apparent then that one of the contributing reasons to the illness or stupidity of the textile industry is the lack of adequate training and educating among personnel.

Science has marched with very rapid strides, but the textile industry in the main is still unaware of it. Pure science has developed amazing techniques which are not being used in the textile field to promote the efficiency that is obtainable. An example of this is the very slight degree to which the technic of p-H concentration has been applied to the chemistry of dyes in the textile industry. Yet in a few places where it has been applied, it has been tremendously valuable. Another example that is almost pathetic is that a whole literature has been written (and all of it proved by laboratory investigation) on the subject of the fastness of fabric dyes. Yet the uninformed textile dyer has made little or no use of it. He has developed few standards and no accurate way of making comparisons. Color in the textile business is judged largely by rule of thumb.

A striking and revealing contrast between the sluggish textile industry and other American industries can be derived from an examination of our leather business. The Morocco process of treating leather was smuggled out of Russia into the United States during the early stages of the tannery development in America. The foundation upon which this process was built was one of highly skilled craftsmanship in which most of the workers had served a sound apprenticeship and were consequently skillful in the general and special requirements of what was in many senses an art. No great lapse of time existed between this event and the extensive adaptation of aniline dyes to the colorization of leather. The increasing prosperity of the American people furnished an extensive market for colored leather articles of all kinds — a market which has never been seriously crippled in spite

Ewing Galloway

of the various substitutes for leather, both dyed and natural-colored, which have been offered in competition. During the period of the development of fancy colored leather and other skins in this country, the variety of hides has been increased by alligator, lizard, and numerous other newcomers into the field. These have been absorbed naturally and their characteristics bent to the market demand both mechanically and decoratively. During this period a healthy development has taken place in tanning research with consequent improvements in the decorations of hides and colors. The improvements in leather products have always been a jump ahead of the improvements in artificial substitutes for it. In other words, the imitator followed the lead of the basic industry and has always leaned upon it.

In the textile industry this has not been true. Even the basic methods have not been greatly improved. One of the best known instances is that of the Jacquard loom which has not been improved upon essentially since it was first given to the industry in 1808. One result is that Jacquard products are very expensive. It seems reasonable to suppose that even if a small percentage of development had been given to it during its 122 years of existence that has been given to machinery in the automobile industry by automotive engineering in 25 years, the Jacquard process today would be fully automatic, from the painted picture to the finished cloth.

As The Review recently pointed out, the last several years have brought the first serious attempts to eliminate noise from our modern civilization. The refrigeration machine, the oil burner, the automobile, and the new insulated buildings bear witness to definite triumphs in the fight for silence. Again the textile industry is supine. The operation of weaving may compete favorably with the boiler factory and the drop forge plant as industrial crimes. There has been no concerted effort made for the elimination of this curse and its attendant economic loss. I have known many excellent men who were diverted from the textile industry in the early stages of their apprenticeship because they were physically unable to stand the noise, and the psychological study which was pointed out in the February Review proved beyond doubt that the loss in human efficiency from this cause is very great. No industry will ever be entirely free from labor trouble which accepts machinery that is as noisy as present day looms.

The genius of Eli Whitney ignited one of the few flames in the industry which has burned brightly ever since. A modern gin is a triumph of engineering, vastly different from the original invention. The steady march of gin improvement has incorporated within its structure the unit drive, the frictionless bearing, economical plate construction, Ford-style methods of manufacture, improved air blast capacity and economy, and wearing ability. For the textile engineer it invites comparison and emulation.

The textile industry needs scientists and engineers. It needs laboratories. It is sick because its diet has included but a limited amount of the vitamines of pure science. It is sick, too, because it never has been willing to submit to managerial therapy of the kind that good sound economists have developed. The textile industry has hardly discovered scientific management. It is high time that our technical schools supply to the industry men who can bring to it these things. It must get in step with modern business, accept readjustment of wages and hours as right and proper, prohibit over-production, eliminate the waste chargeable (*Continued on page 318*)

Ewing Galloway

BATIK PROCESS OF DECORATION FOR SILK SHAWLS, HANDKERCHIEFS, AND TABLE COVERS

CONCEPTION OF NEW YORK'S EAST RIVER WATER FRONT PREPARED BY FRANCIS S. SWALES FOR THE REGIONAL COMMITTEE

CITIES FIT TO LIVE IN

Cogent Suggestions for the City of Tomorrow, a "Machine à Habiter"

By John Nolen

THE CITY OF TOMORROW AND ITS PLANNING, by Charles-Edouard Jeanneret Le Corbusier. Translated from the 8th edition of URBANISME, with an introduction by Frederick Etchells. $7.50. 302 pages. New York: *Brewer and Warren, Inc.*

THE SUBJECT MATTER and illustrations of this volume deserve open minded consideration and wide discussion. It deals vigorously and squarely with one of the most important and difficult problems of modern life; namely, the early re-planning of the central parts of our existing great cities.

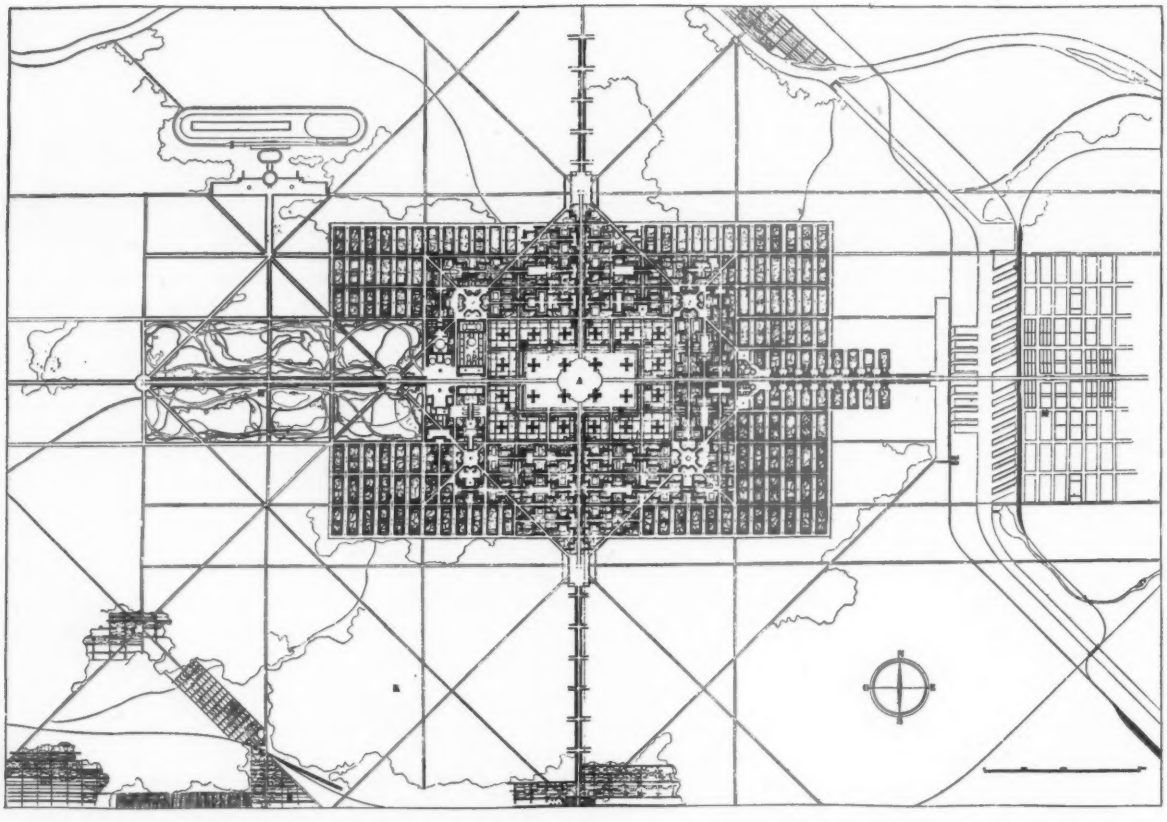
The author, Charles-Edouard Jeanneret Le Corbusier, is a well-known architect in France and Switzerland, a forerunner of the modern school of architects. He began as early as 1914 to exhibit designs in the new style and in 1921 he founded an international review called *L'Esprit Nouveau*. He is a successful practitioner of the art of designing modern buildings, and is recognized as one of the world's authorities in this field. In addition to "The City of Tomorrow and Its Planning," he is also the author of "Towards a New Architecture."

The book presents not merely proposals for a new general order of city layout, a new series of building units, and a new formulation of ideas for traffic; it also discusses a fresh philosophy of modern urban life, and the relation of various professions and agencies that have to do with the planning and construction of cities. The engineer is referred to as a "pearl among men," but as "a pearl on a string, and the only other pearls he knows are his two neighbors." His narrow researches lead him only from an immediate cause to a direct and immediate result. The engineer, he says, is "a fixed being." On the other hand, it is the city's business to solve all its problems in broad relation, and to make itself permanent, and this depends upon considerations other than those of calculation. It is only architecture and city planning that can give all the things which go beyond precise calculation.

Le Corbusier begins by tracing the origin of cities and by discussion of the causes which have led to the present chaotic conditions. He recalls some of the excellent formal town planning of the past, such as Babylon, the Roman colonial towns, Peking, and the great schemes carried out under Louis XIV. These were based on geometry, as his schemes are, and were predetermined "lay-outs." They were in sharp contrast with the European mediaeval towns and many of the older American cities with narrow, winding streets. L'Enfant's plan for Washington probably has his approval.

PROPOSED DEVELOPMENT OF A CIVIC CENTER IN NEW YORK, A PART OF THE CITY'S REGIONAL PLAN

The proposals, it should be made clear, are not intended for country towns or even



LE CORBUSIER'S "CONTEMPORARY CITY." HEAVY BLACK LINES REPRESENT THE AREAS BUILT UPON, EVERYTHING ELSE BEING STREETS OR OPEN SPACES. DISTANCES ARE SHORTER THAN IN CITIES OF TODAY FOR THE DENSITY IS GREATER. KEY: A. — STATION; B. — SKYSCRAPER; C. — HOUSING BLOCKS WITH "SET-BACKS;" D. — HOUSING BLOCKS ON THE "CELLULAR" SYSTEM; E. — GARDEN CITIES; G. — PUBLIC SERVICES; H. — PARK; I. — SPORTS; K. — PROTECTED ZONE; M. — INDUSTRIAL CENTERS. MAP REPRODUCED FROM BOOK UNDER REVIEW

for small cities. He deals with strictly urban conditions, and his main thesis is that a vast and complicated machine, such as the modern great city, can only be made to function on a basis of order. The aim should be, first of all, at efficiency, but not at efficiency alone.

Le Corbusier advocates a bold and drastic reconstruction of the modern city, following in general the principles that have already been applied successfully to other modern construction — to single buildings and the automobile, for example. Two imposing schemes are presented in detail for the reconstruction of a great modern city: one he calls the "Voisin" scheme for the center of Paris: and the other his more developed plans for a new "City of Three Million Inhabitants," which might readily be extended to even greater numbers. The basic principles of his plan are these:

1. *We must de-congest the centers of our cities.*
2. *We must augment their density.*
3. *We must increase the means for getting about.*
4. *We must increase parks and open spaces.*

The whole subject, so far as physical planning is concerned, he narrows down to three essential items: Buildings, Open Spaces, and the Street.

Buildings

The skyscraper would be the unit for the business and hotel district. His plan provides for 24, with facilities for 400,000 to 600,000 occupants, and a density of 1,200 to the acre. This greater density as compared to Paris (146) and London (63) would shorten distances and insure rapid communication. They would be 60 stories in height, cruciform in plan, with no internal wells or courtyards, and set at great distances from one another, surrounded by large open spaces or parks; and they would be used entirely for business and commercial purposes, and not for residence. The skyscrapers would occupy only 5% of the ground in the section in which they were located. At the base and all around each would be an open space of about ten acres, to be occupied by public buildings, theatres, museums, and so on, together with restaurants and cafés, all of which would be relatively low in height.

The residential blocks would employ the principle of "mass production." They would be of two main types. The first with setbacks, and a quite open development, six stories of double height, with no internal wells or windows, looking on either side on to large parks and gardens, with a density of 120 inhabitants to the acre. The buildings in the "setback" section would occupy only 15% of the ground in this zone. The balance would be

for gardens, playgrounds, and so on. The other residential blocks would be on the "cellular" system, with a slightly greater density, looking out on extensive parks, and having no inside courts or wells.

Open Spaces

In the contemporary city probably over 50% of the total area would consist of open space devoted to playfields, gardens, and parks, exclusive of the wide roadways. The roadways and the playfields, parks, and gardens together would make nearly 90%. In other words, only about 10% of the total area would be actually occupied by important buildings of the skyscraper or apartment house types. Moreover, these playfields and parks would be immediately adjacent to the apartments in which the people would live.

In addition to the open space provided around buildings, there would be "the protected zone" immediately outside the built-up city, which would be the property of the city, and upon which all building would be prohibited. It would be an area reserved for the growth of the city, to be laid out by the municipality, but would consist for the present of woods, fields, and sports grounds. The forming of a protective zone by continual purchase of property in the outskirts of the city is one of the essential features. Repeated emphasis is placed upon the necessity for planting and growing large trees in all the open spaces surrounding building groups, not merely for their comfort and beauty, but also as affording a means of bringing buildings into scale with mankind.

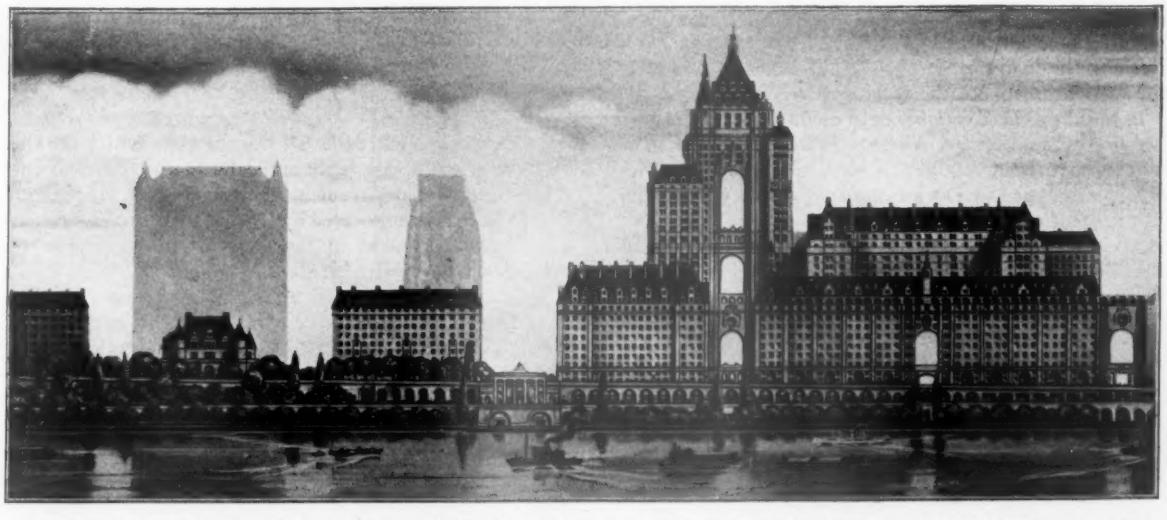
The Street

Le Corbusier protests with vigor against the narrow street, a mere "corridor." He looks upon the city street as a sort of spread-out workshop which is not merely for circulation, but should insure to abutting buildings sunlight and air, easy access, and a provision for the multitude of services underground and on the surface which modern life requires. On the street problem he quotes with good effect from the excellent reports of the Regional Plan of New York and its Environs. This ambitious and optimistic reformer would make, somehow, I know not how, an entire reconstruction of the streets in the modern big city, or in large sections thereof. Streets would be greatly reduced in number, occurring at normal intervals of 1,200 or 1,800 feet, with various expedients for the separation of one form of traffic from another — heavy goods traffic, lighter traffic, and fast through traffic. It would all be centralized in a mammoth central station. There would be five or six street levels in use — two or three below ground, one at the ground level, and one elevated, the latter being the great arterial roads for fast traffic, 300 feet or more in width. The number of existing streets would be diminished by two-thirds, and the number of crossings would be correspondingly reduced. The tramway would be eliminated from the surface in the heart of the modern city.

"The street," writes the author, "is a traffic machine; it is in reality a sort of factory for producing speed. . . . We must create a type of street which shall be as well equipped in its way as a factory. If once we consider seriously the problem of the city and arrive at a solution, our existing great cities will be shaken to their foundations, and the Age of Town Planning on a noble scale will have begun."

The final chapter of the book, the one entitled "Finance and Realization," is not convincing, and perhaps could not be expected to be. However, for city building, no matter how sound the technical ideas may be, there must also be an approved program for legal procedure and the inevitable financing. Briefly stated, there must be —

1. A clear demonstration of the economic justification, not narrowly but broadly conceived. This is difficult, but, I believe, quite possible. (*Continued on page 320*)



THE REGIONAL PLAN COMMITTEE OF NEW YORK HAS PROPOSED THIS MONUMENTAL RAILWAY TERMINAL TO BE LOCATED ON THE HUDSON RIVER BETWEEN FIFTY-NINTH AND SEVENTY-SECOND STREETS. SEE PAGE 296

THE TREND OF AFFAIRS

Welded Ship

STEEL STRUCTURES, welded instead of riveted, are rapidly becoming more numerous as was pointed out in The Review for March. It is now possible to announce that the first all-welded self-propelled American steamship has undergone successful sea tests. The S. S. *Carolinian*, built by Richard E. Smith in the yards of the Charleston Dry Dock and Machine Company, steamed beyond Fort Sumter Light, on March 8, making 11.5 knots an hour. The report is that the ship responded to the helm like a yacht and that vibration was surprisingly absent.

A saving of 20% in weight and 25% in construction cost was accomplished by welding instead of riveting, according to the dry-dock officials. These percentages compare favorably with the saving in weight obtained by welding a building instead of riveting it. It has been demonstrated before the American Institute of Steel Construction that steel floors constructed by the arc-welded battle-deck method permit an increase of 25% or more in the height of a tall building without increasing the load on the foundations. (See the story below.)

In building the *Carolinian* only 8,000 pounds of electric welding was necessary, whereas 28,000 pounds of rivets would have been required. Charles V. Bordkin, Vice-President of the Dry Dock Company, asserts that she has a much greater cargo capacity due to the absence of rivets and bolts and by virtue of the structural form made possible by welding. The two German liners, *Bremen* and *Europa*, are partially welded.

Aluminum Buildings

BEAMS of heat-treated aluminum alloy, tested in the research laboratory of the Aluminum Company of America, have been found to be capable of supporting a 130% greater load per pound of weight than steel beams of corresponding design. For example, a 10-inch aluminum beam carried 2.32 times as much load per pound as a 10-inch steel beam.

This result became known through research undertaken to develop specifications as a standard for designers who may consider the use of aluminum for structural purposes. The tests were carried out with beams 10.5 feet long, the various members ranging from five to ten inches in depth. The plates were rolled, and all angles, channels, and I-beams extruded. All members were fabricated with steel rivets, but, since the test, a technique employing hot aluminum alloy rivets is said to have been satisfactorily worked out.

One's imagination might well run riot in picturing the myriad uses to which structural members of light metals could be put. The tendency to raise the clouds to make room for still higher buildings might well be cited, for the load imposed upon foundations of the present great structures built of steel and heavy masonry is a problem now causing concern in many quarters. And one may be permitted to visualize the almost limitless possibilities for beauty of design in bridges built of aluminum. But adequate data on the cost of aluminum compared with steel, particularly with welded steel, is meagre. Specifications should be available soon.

Ewing Galloway

STEAM "ROCKET" ENGINE DESIGNED BY SIR ISAAC NEWTON IN 1680 BUT NEVER BUILT UNTIL RECENTLY. HIS IDEA WAS THAT STEAM RELEASED FROM THE BOILER THROUGH THE JET WOULD PROPEL THE VEHICLE

Another Gap Filled

ELEMENT NUMBER 87, one of two which at the present time are represented by blank spaces in the formal periodic arrangement of elements that range from one to 92, has been located by Dr. Fred Allison and Edgar J. Murphy, members of the Department of Physics of Alabama Polytechnic Institute.

In a study of lepidolite, a form of mica, and polucite, a mineral which consists chiefly of the elements of caesium, aluminum, and silicon, these two workers have detected effects which indicate the presence of the unknown element. The tentative name, eka-caesium, has been assigned to it.

Element 87 is classified as one of the alkali family. It lies between niton, Number 86, also known as radon, and radium, Number 88. Because of its proximity to these two, it has been generally supposed that the hitherto missing element may be extremely radioactive.

This new element takes its place in a group of elements which are identified only by means of their lines in the x-ray spectrum. The one remaining element that still awaits discovery is Number 85, which lies in the iodine classification.

Further research will be undertaken in an attempt to extract the new element from the minerals in which it has indicated its presence.

Element 87 is the second to be identified by American scientists. The first was Number 61, which was found by Dr. B. S. Hopkins, who named it illinium in honor of the University of Illinois where he carried on the research that resulted in its detection. Number 72, hafnium, another of the "post-war" elements, was discovered in 1923, by the Danish scientists, Coster and Hevesy, who gave it the Latin name for Copenhagen. Two years later Dr. Walter Noddack of the University of Berlin, working with two research assistants, discovered Elements 43 and 75, which were given the names of masurium and rhenium. Dr. Hopkins found Number 61 in 1926.

Spraying Quartz

VISITORS who properly time their call at the Thomson Laboratory of the General Electric Company at Lynn, Mass., may observe the spectacular process of making mirrors by subjecting a block of melted quartz sand to a shower of melted, powdered silica glass (quartz). The powder, melted by a roaring oxygen-hydrogen torch at a temperature of 3000 degrees, is squirted upon the quartz sand in order to obtain a mirror surface which may be ground to the delicate contours required for use in telescopes.

This process, developed by Dr. Elihu Thomson, Non-Resident Professor of Electrical Engineering at the Institute, is to be used for making the gigantic 200-inch telescope mirror required by the great telescope that the California Institute of Technology plans to set up to supplement the work of the Mt. Wilson Observatory.

If a mirror with the diameter of 200 inches were constructed of glass, the variations in its form induced by temperature would be so serious as to produce bad distortions in the image which it would give. Quartz remains practically constant under all ordinary temperatures. Consequently, a mirror made of it would be easier to grind and to use upon completion.

This successful solution of the problem of providing a rough bubble-filled mass of melted sand with a surface layer of pure glass-like fused quartz or silica glass is a major contribution to optical science. It is but one more in a long line of brilliant scientific achievements made by Dr. Thomson. Adumbrated they are:

1. Discovery of the laws governing the electric arc
2. Invention of the arc light dynamo and regulator
3. First to utilize magnetic field to move an electric arc
4. Discovery of so-called alternating current repulsion phenomena, the basis for a.c. motors
5. Building of high-frequency dynamo and transformer
6. Invention of electric welding by incandescent method
7. Invention of electric watt-hour meter
8. First to make stereoscopic x-ray pictures.

More Helium

SINCE HELIUM (Greek ἥλιος, sun), next to hydrogen the lightest gas,

THE S.S. *MALOLO* IN DRY DOCK

Ewing Galloway

was discovered on the sun in 1868, diligent search has been made of our own planet to find it in quantities sufficiently large for use in airships. The only natural sources yielding large amounts have been found in the United States, notably in Texas, and now comes word that it is obtainable from natural gas in southeastern Colorado, south of Thatcher. F. F. Hintze, of the University of Utah, who reports the new source, states that the natural gas contains 7% of helium, a much higher percentage than has yet been found anywhere.

Previously, the chief sources of helium have been at Amarillo in the Texas Panhandle and at Dexter, Kans. Other fields have been found in Canada near Hamilton, Ontario, and Calgary, Alberta, but these sources are small in comparison to those in the United States. In France, mineral springs at Mazières and Santenay yield small amounts as does a spring at Bath, England. English chemists are now striving to obtain it from some of the helium minerals, such as monazite, thorianite, euxenite, cleveite, fergusonite, bröggerite, and samarskite. Monazite sand from India seems to yield about one cubic centimeter of helium per gram of sand.

Excommunicating Windows

MENTION was made in the March Review of the possibilities for windowless buildings which, in the opinion of competent architectural and engineering critics, are both probable and desirable. To the chorus of approbation must now be recorded the predictions of Dr. Zay Jeffries, a metallurgist of Cleveland, made before the American Institute of Mining and Metallurgical Engineers. "The Future of the American Iron and Steel Industry," was his chosen subject for the Howe Memorial Lecture, given annually to commemorate the attainments of Henry Marion Howe, '71, the John Fritz Medalist of 1917.

The window, Dr. Jeffries arraigned, as "not always effective in letting in light. The room is usually either too dark or too light. It is a source of drafts and usually makes for uneven temperature. It lets in the rain, snow, dust, and insects. It is easily broken and often hard to open and close. It increases fuel bills and often foils privacy, and in some cases it provides a too ready means of exit in case of a stock market crash. It also provides a popular burglar entrance. Artificial light, artificial sunlight, and artificial ventilation would permit the use of cheaper construction and completely enclosed rooms, free from drafts, uneven temperature, city noises, and other disturbances. . . ."

Windowless rooms would be cool in summer and warm in winter. They would release much steel now required for building construction, but Dr. Jeffries finds no basis for the fear of an iron famine, though the production of iron in the United States has increased tenfold since 1885, during which interim the population has doubled. "It can be stated with certainty that there is ample iron in the earth's crust for all possible future needs" and America, he believes, has enough deposits of rich iron ore, relatively free from objectionable impurities, geographically accessible and capable of being cheaply mined, to last another generation. Beyond these remain unlimited quantities of lower grade deposits.

BUSY WHARVES

H. Armstrong Roberts

"Noble Terminal"

IT WAS assumed that the completion of the Grand Central Terminal twenty years ago, followed by that of the Pennsylvania Station in 1913, would settle New York's railroad troubles for a long while. But the concept of the "Regional Plan of New York and Its Environs," disclosed last month as a series of projects for the development of the city's waterfronts, includes an imposing railway terminal giving upon the Hudson River between 59th and 72d Streets, the present location of the New York Central's 60th Street freight yards.

With all her congestion of humans and their traffic difficulties and hubbub, New York, it seems, is not so badly off as regards her waterfront, for about half of her 29-mile shoreline is still free from commercial usage. Ten miles of it are now devoted to park purposes.

Because of what has already taken place in the way of a comprehensive development of Manhattan's littoral, as contrasted with the existing unsightliness and inaccessibility of the neglected portions, the Regional Plan advances its suggestions as a safeguard against further despoliation rather than as a scheme to be undertaken in its entirety and followed precisely.

The studies have been carried out under Thomas Adams, a Special Lecturer in the Institute's Department of Architecture, as General Director of Plans and Surveys

and Mr. Adams will continue as a consultant to the Regional Plan Committee. The design (on page 293) showing the type of terminal which might be constructed is by Francis S. Swales, consulting architect.

"It does not need much imagination," says the Plan's report, "to see how valuable it would be to have a new center on the edge of the Island, overlooking the wide expanse of the Hudson, directly connecting with the great spaces of New Jersey, directly served by the main line of the New York Central, and linked up with approaches to the Battery that are independent of the congested streets in the center of the Island. . . .

"The building of a new station over the 60th Street yards might at present be out of harmony with the policy of the railroad company in the development of its freight service, but undoubtedly from the point of view of the ultimate interests of the company and of the community, the greatest and most inspiring opportunity for New York lies in setting up a monumental station between 59th Stteet and 72d Street, such as Mr. Swales has attempted to visualize. . . . Here there are the same opportunities of obtaining increased values as were realized about Grand Central Station after electrification.

". . . If one stands today on the top of a building overlooking the 60th Street yards, he will see almost exactly the same kind of conditions that existed in the Grand Central terminus before 1905. The only differences are that the destruction of property values by the steam railroad has been lessened to the north by the existence of Riverside Park, but has continued south of 60th Street, and that the 60th Street yards have a natural setting which the Grand Central or the Pennsylvania Stations never had. These two latter terminals have, since they were improved, created values for the railroads and the public which have made them splendid investments. But the greatest opportunity for a really noble terminal in Manhattan lies on the Hudson River front. . . ."

Ewing Galloway

IN A COPPER SMELTER AT MIAMI, ARIZ.

Flying Miles

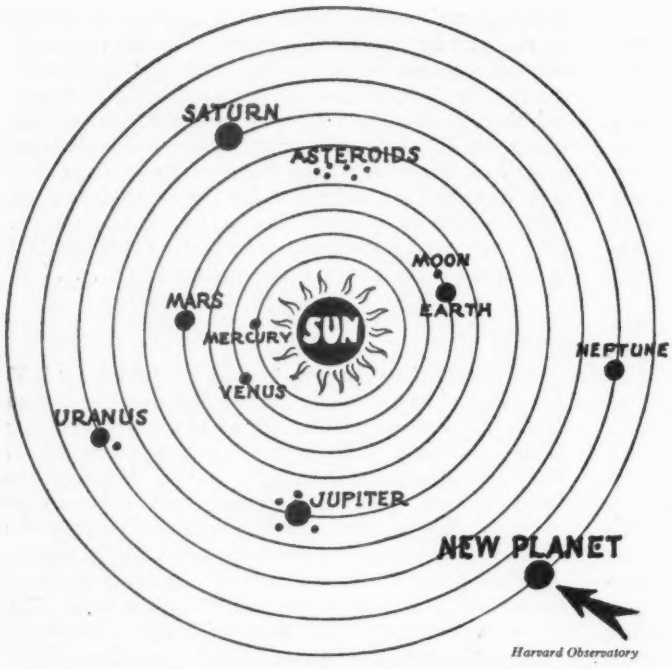
ACCORDING to the new Aircraft Year Book for 1930 released to the public a short time ago, the United States is far ahead of the rest of the world in flying mileage. During 1929 military, civil, and commercial flights increased to 197,546,590 miles, doubling the figures of 1928. Military operations comprised less than one-third of this mileage, whereas in foreign countries such operations made up the major part of flight figures. The report also points out that private flying increased from 12,000,000 miles in 1928 to 25,000,000 miles in 1929.

On scheduled routes of American air transport services mail and passenger flights covered more than 90,000 miles every 24 hours. The mail poundage for 1928 doubled to 7,096,930 in 1929, while passenger transportation tripled to 165,263 persons. This past year has also brought reduced passenger rates on the major air transport lines, dropping from 10.6 cents per mile to 7.8 cents. Although the number of air transport operators in scheduled service decreased from 32 to 27, due to consolidations and elimination of duplicate lines, the number of planes in service jumped from 297 to 619. Twenty-seven transport lines averaged eight men employed on the ground for every pilot in the air.

The tremendous increase in air mail service without a corresponding increase in the number of airways is attributed to the added night flying. One report indicates that one American line gained more mileage at night than the total mileage of all scheduled night operations in Europe. Quoting directly from the report: "Scheduled transport lines were flying one-third of their 90,000 miles every 24 hours between dusk and dawn on lighted airways, providing night service unparalleled in the world." In passenger miles also the United States unquestionably leads the world, since our most heavily traveled routes are considerably longer than those of Europe. Of the 40 new routes listed by the Department of Commerce in 1929, 24 are used exclusively for passenger service.

The approval of 80 large corporations, signified by authorizing their employees to travel by air, has had a decided influence on air transport propaganda. The transition from corporation effort to group control, and greater public support resulting in a sounder financial basis account for the almost phenomenal expansion of lines.

The recent announcement by Fokker Aircraft Corporation that the sale of airplanes may now be made on the deferred payment plan — one-third down and the balance in twelve equal payments — will make purchases of



ORBIT OF THE NEWLY DISCOVERED TRANS-NEPTUNIAN PLANET

planes by transport companies and individuals much more feasible. With adequate terminals now provided, schedules timed with water, rail, and bus transportation, and technical problems, such as fog flying, radio communication, radio beacon development, and radio direction-finding gradually being solved, there is predicted an increasing acceptance of air transportation during 1930 and thereafter.

Planet Number 9

ANOTHER PLANET has swum into human ken and Neptune loses its distinction of marking the frontier of the solar system. This addition to the retinue of the sun, long suspected, was fittingly announced on March 13, the birthday of the late Dr. Percival Lowell (1855–1916) who mathematically predicted it in 1914, and founded the observatory at Flagstaff, Ariz., where it was finally discovered last January 21. Dr. Lowell was, from 1908 until his death, Non-Resident Professor of Astronomy at Technology.

The discovery, the first since 1846 and the third in historical times, consisted in photographing the planet through an extremely delicate lens, designed and used in accordance with a mathematical theory which pointed the way. It was a brilliant triumph for the scientific method as well as for American astronomy. The astronomers who participated in the discovery are C. O. Lampland, E. C. Slipher, J. C. Duncan, K. P. Williams, E. A. Edwards, and T. B. Gill.

These men estimate that the new planet, yet unnamed, is 45 times as far from the earth as the earth is from the sun, but they have not yet determined its size beyond the fact that it is as large as the earth. Studies are underway already to determine the physical aspects of this Trans-Neptunian planet.

THE eight planets of the solar system, pictured diagrammatically on the page, that have hitherto been known, in the order of their proximity to the sun, are (figures are approximate):

P. & A.

UTILIZING AN OLD ROMAN TUNNEL, ITALIAN ENGINEERS HAVE DRAINED LAKE NEMI OF "GOLDEN BOUGH" FAME AND UNCOVERED CALIGULA'S GALLEY, SHOWN HERE

Underwood and Underwood

PILOTS AND PLANE OF THE GERMAN AERIAL WEATHER BUREAU. IN THE FOREGROUND, ATTACHED TO THE PLANE, IS A BAROGRAPH FOR RECORDING WEATHER CONDITIONS BETWEEN ALTITUDES OF 500 AND 7000 FEET

	Mean distance from sun	*Diameter*
Mercury	36,000,000 miles	300 miles
Venus	67,200,000	7,500
Earth	92,900,000	8,000
Mars	141,500,000	4,200
Jupiter	483,300,000	86,000
Saturn	886,100,000	72,000
Uranus	1,782,800,000	30,000
Neptune	2,793,500,000	32,000

Six of these were known to the ancients, but it has taken 3,000 years to bring the total up to nine. Uranus was discovered by Sir William Herschel on March 13, 1781, just 149 years prior to the announcement of this latest one. In 1846 Neptune was added to the list by the independent work of Leverrier and Adams. Its discovery came as a result of the mathematical work inspired by the unexplained irregularities in the motion of Uranus. It was similar unexplained perturbations in the orbit of Neptune that gave Dr. Lowell a hint. From time to time during the past half century various astronomers have attempted to repeat the feat of Leverrier and Adams. "Flammarion," says Dr. Hector MacPherson in his "Modern Astronomy," published in 1926, "computed the possible orbit of the [then] hypothetical body, and Lowell and W. H. Pickering ['79] assigned its elements and even its possible place in the sky. . . . The balance of evidence is on the side of the view . . . that Neptune is the most distant member of the Sun's family." No doubt Dr. MacPherson deeply regrets now that cautious bit of skepticism. Perhaps the achievement of Dr. Thomson in making quartz mirrors as described on page 295 will reveal still other planets.

The word planet is derived from the Greek word meaning wanderer and it was first applied by the ancient Ptolemaic or geocentric astronomers. In the modern sense it is applied to the dark and opaque bodies which revolve about the sun. In its wider sense it includes the satellites attendant on the greater planets. Of these secondary planets, Neptune possesses one, Uranus four, Saturn nine, Jupiter nine, Mars two, and the Earth one.

Aeronautical Shows

NEW YORK and St. Louis have shared honors this year in sponsoring important aeronautical shows which have vied with the automobile shows in attracting public attention. The attendance at the New York Show was estimated as half again as large as it was last year and the St. Louis Exhibition was so popularly received that it left no doubt about the public interest in aeronautical developments.

The New York Show was primarily an exhibition of airplanes and aeronautical equipment, whereas those in charge of the St. Louis Exhibition gave the manufacturers

WILLIAM H. BASSETT, '91, RECENTLY ELECTED PRESIDENT OF THE AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS. HE IS TECHNICAL SUPERINTENDENT AND METALLURGIST OF THE AMERICAN BRASS COMPANY

an opportunity to discuss educational, engineering, and transport problems pertinent to the sound development of the industry. One of the principal speakers at the educational meetings was Edward P. Warner, '17, — former Assistant Secretary of the Navy for Aeronautics — who said, "The field for graduates in aeronautical engineering will become smaller as the saturation point nears and it is important that we do not encourage so large a number of students to take specialized aeronautical engineering courses that they are unable to find a permanent place in the industry. The universities and colleges should devote their major attention to giving aeronautics proper treatment in regular courses already established, rather than in setting up new schools and highly specialized curricula. . . ."

Non-Corrosive Steel

WHEN the French Academy of Science met in Paris in 1797, Louis Nicolas Vauquelin, a brilliant young French chemist who rose from the humble station of an apothecary's apprentice to become the associate of the great Anton François Fourcroy, announced that he had isolated a new metal. He had produced it, he said, from a Siberian mineral, lead chromate, and found it amazingly hard, of lasting, brilliant lustre, and of high melting point. Neither he nor his scientific associates in that meeting 133 years ago dreamed, however, that Vauquelin had discovered chromium.

Out of Vauquelin's discovery has come the development of non-corrosive steel, with characteristics which make it possible and very desirable for purposes unthought of a few years ago. Thus history is repeating itself in the use of metal after the manner of craftsmen of the past whose skill and artistry has not to this day been exceeded. With new tools and new methods we now enter the era of nickel-chromium steels, which, because they are non-corrosive and retain the brilliant white lustre of platinum indefinitely, can be adapted for innumerable uses, both decorative and practical. These new steels are being used in a striking manner for ornamenting the façades of modern buildings; they have been adapted for furniture, and in the field of engineering, for structural purposes where their non-corrosive properties give them great value in permanent construction.

Tons of non-corrosive steel reinforcing bars have been used in the work of strengthening the ancient dome of St. Paul's Cathedral in London. The new steel is expected to have a wide use for window frames in modern buildings, and it is quite likely that it will find a new field of usefulness in ship construction, for neither salt nor fresh water have any corrosive effect upon the alloy.

Chromium is obtained from chromate ore, which belongs to the same group as molybdenum, tungsten, and uranium, and is found in various parts of the world. Chromium is harder than the hardest steel, and than many of the gem stones, even approaching the ruby and sapphire. This quality, together with its great resistance to corrosion and high temperatures, and high reflectivity, is a characteristic which gives it a wider application than any other metal.

Contrary to popular belief, chromium is not a rare metal. The ore from which it is obtained is found in large quantities in many parts of the world, but because of cheap labor 70% of the supply comes from Africa. The ore is also found in the western United States, in India, and New Caledonia. In 1926, for instance, the world production of chromium was 150,000 tons compared with 7,000 tons of tungsten, 50,000 tons of nickel, and 1,800,000 tons of copper. Under x-ray analysis part of chromium resembles silicon while part has the appearance of magnesium. The world's supply of the ore exceeds that of copper, and 45% of the chromium production is used in alloys. Much is also used in plating processes.

Rain, snow, sea water, changes in temperature, oil, and many acids have no effect upon it, and it retains its brilliant lustre indefinitely. It is being employed as a plating for yacht and ship fittings subject to the corrosive action of salt water. It is likewise used for plumbing fixtures, electrical household apparatus, small motors, and jewelry.

The stainless steel, now widely used in the manufacture of cutlery, is an alloy of 13% chromium and iron. This alloy is unaffected by fruit juices or gases which quickly discolor or corrode ordinary steel.

In the plating process chromium usually is applied over a coating of nickel, although it is claimed it can be plated directly on most of the metals in use. It has been found very satisfactory for use as a reflecting surface in automobile headlights, for its brilliant platinum-like lustre is undiminished after long use.

BOOKS

Ars Medendi

MEDICINE: ITS CONTRIBUTION TO CIVILIZATION, by Edward B. Vedder. $5.00. ix+398 pages. Baltimore: *Williams and Wilkins*.

MEDICAL LEADERS: FROM HIPPOCRATES TO OSLER, by Samuel W. Lambert and George M. Goodwin. $5.00. 331 pages. Indianapolis: *Bobbs-Merrill Company*.

THE STORY of the many notable achievements of modern medicine is of direct concern and interest to all of us. The prodigality of books of varying degrees of competency, and unfortunately also of mediocrity, on the subject bears witness to the fact. These two books are, however, noteworthy in the field, not only for their skillful, accurate, and well-ordered presentations, but for the fact that neither is marred by flippant attempts at philosophy, efforts which in certain other popular books on health and its makers have been more often banal than otherwise.

One of these books is concerned with the practical application of medical science to everyday life, while the other is the narrative of those great personalities who have been chiefly responsible for the conversion of medicine from magic and conjecture to science. Colonel Vedder's book has somewhat more verve than the other, but both are, in general, written in a straightforward, pleasing style, without embellishment. Both are much more authoritative than most of the recent books on either of the topics dealt with.

The gamut of modern medicine, in its application to personal health, is adequately covered by Colonel Vedder. His book is divided into two parts, the first dealing with the multifold causes of various diseases, and the second with the present accomplishments in disease prevention and the future problems in the field. Although all of it is eminently practical, he lapses into an essay in his chapter on cancer, especially when he endeavors to prove mooted points. The remainder of his material consists mostly of irrefutable facts, though in one place he is, perhaps excusably, not wholly up to date. The chapter on nutrition, for example, would have been brilliant five years ago, but in the light of recent developments in this rapidly advancing science, his discussion of the vitamins, which he calls by the generally discarded term, "vitamines," is rather inadequate. These are minor deficiencies in a well balanced, useful text.

The history of medicine by Drs. Lambert and Goodwin is exceptionally well told, even if it makes no conscious attempt to be dramatic, as is possible and would be legitimate, in view of the significance of the subject. From the days of Æsculapius, the galaxy of celebrated physicians who have graced the centuries and contributed to the healing art, is described. As is customary in most histories of medicine, much more space is devoted to the evolution of curative medicine than to preventive. One chapter is concerned mainly with Jenner and Pasteur, and another with Gorgas, the last named as representative of public sanitation. General Gorgas appeals to the popular mind as the outstanding sanitarian, but he was really only an exceptional administrator who applied scientific facts developed by Walter Reed and his colleagues. There is no mention of Sedgwick, who was as notable as Gorgas, and only passing reference to Florence Nightingale, who, although a nurse, was undeniably a medical leader.

In physical make-up, as in interesting, and sometimes curious, facts, these two books are satisfactory. The reader, whose pleasure in perusing Colonel Vedder's book will be disturbed slightly by having to cut so many pages, will get a thrill from the sixty-foot tapeworm described, as well as from the tick-carrying gophers and the filaria that, for some unknown reason, can circulate in the peripheral human blood only at night. Anecdotes such as the manner in which John Hunter obtained the skeleton of the Irish giant, also enliven the book of Drs. Lambert and Goodwin, though the reader will look for these and other items in the index in vain, for there is none.

These two books, different and yet similar in so many respects, can be highly recommended to the intelligent lay reader, who would and should learn something to his advantage about the perennial subject of human health.

JAMES A. TOBEY, '15

City Planning Comes of Age

OUR CITIES TODAY AND TOMORROW, by Theodora Kimball Hubbard and Henry Vincent Hubbard. $5.00. 389 pages. Cambridge: *Harvard University Press*.

THIS WIDE SURVEY of planning and zoning progress, encyclopaedic in character, is timely, and of great practical value. The only other review of city planning comparable in any way was that made in 1917 by the Committee on City Planning of the American Institute of Architects, entitled "City Planning Progress," edited by George B. Ford. The basis of merit and thoroughness of which the volume of the Hubbards gives so much evidence has been made possible by a grant to Harvard University from the Milton Fund for research. This grant permitted the engagement of a field representative, Mr. Howard K. Menhinick, a keen observer, to visit about 120 cities and nearly a score of counties and regions in many parts of the United States, in order to secure first-hand information. The field notes on subjects of particular current interest are printed in the Appendices. More important, however, is the fact that the results of this study have been assimilated by the authors and closely integrated in the book itself.

Some of the beacon lights of city planning achievement receiving special mention are: St. Louis, Cincinnati, and Memphis, for comprehensive planning programs in larger cities; and for smaller communities: Kenosha, Wis., or

Ponca City, Okla.; Chicago and Detroit for magnitude and brilliance of enterprise and for leadership in regional development; Milwaukee and Los Angeles for wise city and county coöperation in producing harmonized plans; Denver and Philadelphia for the visible enbodiment of civic pride; Johnstown, Penna., and Dallas for the training of citizens, young and old, in knowledge and support of planning; Pittsburgh and Boston for steady welding of planning into the structure of municipal government; New York for leadership in regional research; Washington for crystallization of national ideals of dignity and beauty; and many others for high achievement and bold undertakings or patient persistence in day-to-day shaping of the community of the future.

The authors, it is quite evident, have had the city's appearance in mind throughout, but the subject is discussed directly in only one chapter. It is well set forth, especially in connection with civic centers, their architectural aspects, and their place in comprehensive plans. The commercial value of beauty and civic attractiveness is also suggested. Three types of communities in which positive beauty is peculiarly essential are mentioned: namely health and pleasure resorts, residential towns and suburbs, and great metropolitan centers. Apt examples of these three types are given. "Commerce and industry," the authors hold, "have recognized their insufficiency in satisfying human needs, without accompanying manifestations of beauty. Since the World's Fair of 1893 some of our cities have come a long way from the prevalent unsightliness of haphazard growth, but many of them are just beginning to learn the lesson that they can reap substantial benefits in economic productiveness and social development through achieving order and seeking beauty."

The importance of subdivision control is well discussed. It is pointed out that the control of undeveloped land within and around urban communities offers the greatest opportunity for constructive planning as distinguished from replanning. Wise measures of control can produce types of development in new areas adapted to modern standards of light and air and space and in line with the dictates of modern public health ideas.

"Our Cities Today and Tomorrow" makes a wide appeal. The book is indispensable to the technician, and should be owned by all those engaged professionally in city planning activities. The lawyer concerned with city planning will find the volume directly useful. There are half a dozen chapters in which information of a legal character can be had in better form than anywhere else, and the whole book throws light on the legal machinery and public control essential for city and regional planning enterprises. While not a textbook in the ordinary sense, the volume will be of great value in educational institutions where city and regional planning and related subjects are studied, either profesionally or from a general educational viewpoint. Its greatest source of usefulness, however, may readily prove to be with the citizen upon whom the advance of city planning so much depends. Among the most interesting and directly helpful chapters to the general public are those dealing with "Educating the Public to Support City Planning," "Financial Programs," "It Pays to Plan," and "Lines of Future Progress."

In the final chapter the authors give a useful discussion of research in this field, and its relation to future progress. The following may be quoted: "In the selection of subjects of research, those should have first place which are likely to yield results bearing a direct relationship to human welfare. The environment for human living, working, and playing constitutes the whole physical and social background of planning. The more we think in pictures of space and light and air and amenity and the less in terms of formulae and statistics the more vital will be the practical effects of specialized study. The difficulties and obstacles encountered in cities in various parts of the country deserve more thorough ventilation and analysis. Such problems can never be solved by research alone, but by exchange of interpreted experiences there is a vast amount to be learned." It is not enough that the result of research should be presented in good form for technical use. The most significant facts and conclusions should also be given popular form — as in the publications of the Regional Plan of New York.

There is an excellent brief review of the subject of air terminals in connection with the discussion of rail and water terminals, and reference is made to the fact that a grant from the Milton Fund to Harvard University has been authorized which will provide for an airport study, to consider the financing and administration of airports, and their relation to the city plan.

There are some three dozen illustrations — diagrams, cartoons, charts, and photographs — in the book, of great variety, and they all illustrate admirably the point to which they refer. They are not mere pictures.

In the concluding chapter of the book the authors discuss in a plain and practical way the character of the American city of tomorrow. Perhaps the central sections of a great metropolis like that of New York or Chicago may in the future be reconstructed along some such radial lines as those proposed by Le Corbusier in his volume on "The City of Tomorrow and Its Planning." But New York and Chicago are not the United States. The authors of this forward-looking but sane volume dismiss "turreted Babylon," somewhat peremptorily, but they make bold to predict that the American city of the future will have enough open land to prevent the merging of neighborhoods in a soulless urban mass; that if its central buildings are high, they will, nevertheless, be proportioned to streets, traffic, and open spaces; that the growth will be a balanced growth, and that private rights and public rights will be reasonably adjusted so that "each may enjoy his own right to light and air and space and touch with the life-giving earth." If this can be realized, it would seem to be Utopia enough in this modern commercial world of ours.

JOHN NOLEN

Modernism in the Home

THE NEW INTERIOR DECORATION, by Dorothy Todd and Raymond Mortimer. $6.00. 42 pages. New York: *Charles Scribner's Sons.*

AN admirable book! It explains lucidly and illustrates amply the philosophy and form of modern interior decoration. If there are still people who believe that modern decoration is not a desirable and explicit im-

pression of our own time, let them first turn to Plate 4, opposite Page 6, and contrast the two rooms pictured there. One room is a relic of the late Nineteenth Century, a paroxysm of decoration, over furnished, lush as a Victorian love story. The other room designed by Djo Bourgeois, graceful by virtue of the elimination of the unnecessary, is a true reflection of the contemporary *Zeitgeist*, the spirit of the time. Except in the minds of those still dwelling in the period of the Regency there can be no doubt about the superiority *for use by we moderns* of the latter room.

"The contemporary movement in the arts," say the authors, "has now developed a vigor which makes all attempts to disregard it ridiculous . . . and it is the thesis of this book that already work in the applied arts is being produced which can take its place with the fine products of the past, and which at the same time is highly original and characteristic of the present . . ."

After discussing the influence of contemporary painting and architecture on decoration, continental, English, and American decoration is surveyed. There follows next 154 plates, and finally a chapter *Methods and Features*.

Only a page is devoted to American decoration, though one could hardly expect more since American art is "still subservient to European traditions. . . . Having constructed a building that is admirably composed in mass, they [Americans] suddenly remember Chartres or Venice, and decorate its top and bottom stories with irrelevant imitated ornament." Too true, but there is a growing number of vigorous exceptions, as a survey of New York's skyline will immediately prove. And what of the Exhibition of Contemporary American Art at the Metropolitan Museum of Art last year? None of the significant contributors to that exhibit are mentioned in naming the Americans who have done acceptable modern work.

All in all a judicial and illuminating book.

J. R. K., Jr.

SAN FRANCISCO FROM THE CLAUS SPRECKLES BUILDING

Ewing Galloway

President-Elect of the Institute

Dr. Karl T. Compton, Chairman of the Department of Physics, Princeton University, who becomes President in July

DR. COMPTON HAS THE FOLLOWING DEGREES: PH.B., COLLEGE OF WOOSTER, 1908; SC.M., 1909; PH.D., PRINCETON UNIVERSITY, 1912; SC.D. (HONORARY), COLLEGE OF WOOSTER, 1923; LEHIGH UNIVERSITY, 1927

TECHNOLOGY is to have both a Chairman of the Board and a President. Dr. Stratton continues as titular head of Institute, but in July the name of his office will be Chairman of the Executive Committee and of the Corporation. The Presidency which he leaves vacant will be filled by Dr. Karl T. Compton, Chairman of the Department of Physics at Princeton University.

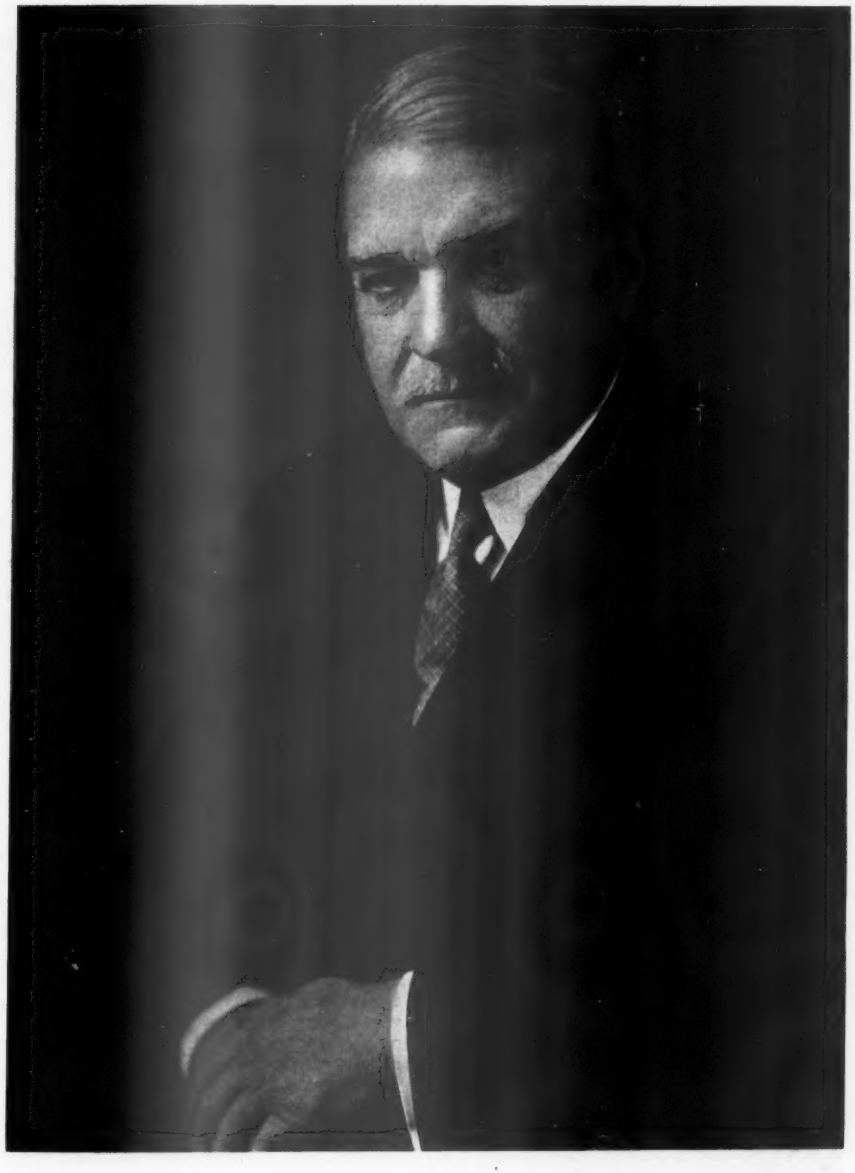
This new executive organization, strikingly similar to that of a large business corporation, will permit a distribution of the Institute's innumerable administrative duties between two men. A study, initiated by Dr. Stratton, by the Executive Committee of the Corporation made it apparent that the problems of administration have grown so enormous that they should be divided. Traditional educational administrative organizations are no longer adequate to meet the complex problems of today.

The Institute feels it is most fortunate in securing the services of a young man of such distinction as Dr. Compton, who at the age of forty-two, is one of the outstanding physicists of America, and an educator of wide experience.

Dr. Compton was born at Wooster, Ohio, September 14, 1887. He is the son of Elias Compton, a Presbyterian clergyman and Emeritus Dean, Acting President and Professor of Philosophy in the College of Wooster. One brother, Dr. Wilson M. Compton, is Secretary and Manager of the National Lumber Manufacturers Association, while his other brother, Arthur H. Compton, is Professor of Physics at the University of Chicago and was awarded the Nobel Prize Laureate in Physics in 1927. His sister, Mrs. Charles Herbert Rice, is the wife of the President of Ewing College in Allahabad, India.

Chairman-Elect of the Corporation

Dr. Samuel W. Stratton, who suggested and will fill a new administrative position at the Institute



DR. STRATTON HAS THE FOLLOWING DEGREES: B.S., UNIVERSITY OF ILLINOIS, 1884, D.ENG., 1903; D.SC., WESTERN UNIVERSITY OF PENNSYLVANIA (NOW UNIVERSITY OF PITTSBURGH), 1903, CAMBRIDGE, 1909, YALE, 1919; LL.D., HARVARD, 1923; PH.D., R.P.I., 1924

Dr. Compton has held the following positions: Instructor in Chemistry, Wooster, 1909–1910; Instructor in Physics, Reed, 1913–1915; Assistant Professor of Physics, Princeton, 1915–1919; Professor of Physics, 1919–1930. He is also Research Professor and Chairman of the Department of Physics in Princeton University. He is a Fellow of the American Physical Society, and of the American Optical Society; a member of the National Academy of Sciences, the American Philosophical Society, the American Chemical Society, the American Electrochemical Society, the Franklin Institute, Deutsche Physik Gesellschaft, the American Association for the Advancement of Science, Phi Beta Kappa, and Sigma Xi.

He was Vice-President of the American Physical Society from 1925–1927 and President from 1927–1929, and was Chairman of the Division of Physics of the National Academy of Sciences 1927–1930. He is a member of the Executive Committee of the National Research Council and of the American Association for the Advancement of Science. He is Chairman of the Physics Sub-Committee of the National Research Council on the Chicago 1933 Exposition. For a number of years he has been Consulting Physicist for the United States Department of Agriculture.

He is the author of many publications dealing with research in photo-electricity, ionization of gases, soft x-rays, spectroscopy in the extreme ultraviolet, fluorescence and dissociation of gases, electric arcs, and other types of gas discharge.

Dr. Compton is married and has three children, Mary Evelyn, Jean Corrin, and Charles Arthur. Mrs. Compton is a daughter of Professor J. Corrin Hutchinson, Emeritus Professor of Greek in the University of Minnesota.

THE INSTITUTE GAZETTE

Chairman and President

THE Review hastens to felicitate President Stratton on the new administrative set-up which he has sponsored. It feels that the arrangement of having Dr. Stratton as titular head of the Institute in his capacity as Chairman of the Executive Committee and the Corporation and Dr. Karl T. Compton as President will be a particularly happy solution of the immense problem of governing Technology.

The Review is sure that it is voicing the sentiment of the entire Alumni Association when it welcomes Dr. Compton and wishes him a long, happy, and successful tenure of office.

Alumni Association Nominations

BALLOTS went out on March 20 to members of the Alumni Association containing the names selected by the Nominating Committee to fill the nine offices annually made vacant in the Alumni Association. Together with these ballots were mailed the names of the nine candidates for Term Membership on the Corporation. The Alumni body selects three from this list and submits them to the Corporation for formal election by that body. As successor to Paul W. Litchfield, '96, now President of the Association, the man presented is Thomas C. Desmond, '09, President of T. C. Desmond and Company, Inc., of New York City. From the Class of '09 comes another man who has been prominent in Institute affairs, Maurice R. Scharff, '09. Mr. Desmond is Chairman of the All-Technology Reunion Committee for 1930 and in 1926–1927 was President of the Technology Clubs Associated. He has been President of the New York Young Republican Club and active in politics in the state. His executive ability and his knowledge of Institute affairs, as well as his unlimited energy, will be of great value to the Association.

Harold B. Richmond, '14, retires as the senior Vice-President and is succeeded by Francis J. Chesterman, '05. Taking Mr. Chesterman's place as the junior Vice-President is Donald G. Robbins, '07, an engineer associated with Hornblower and Weeks of Boston. The two new members of the Executive Committee are Raymond S. Stevens, '17, associated with Arthur D. Little, Inc., of Cambridge, and Henry E. Worcester, '97, Vice-President of the United Fruit Company. These men replace the retiring members, Samuel C. Prescott, '94, and Edward B. Rowe, '06, of Norwood White and Company, Inc., of Boston.

FREDERICK S. WOODS, PROFESSOR OF MATHEMATICS, WHO BECOMES HEAD OF HIS DEPARTMENT UPON THE DEPARTURE OF THE PRESENT HEAD IN JUNE, PROFESSOR HARRY W. TYLER, '84. PROFESSOR TYLER LEAVES TO BECOME A CONSULTANT TO THE LIBRARY OF CONGRESS

Five more names are on the annual ballot for Representatives-at-Large on the Alumni Council: James I. Banash, '06, of Chicago, Ill.; W. Rawson Collier, '00, of Atlanta, Ga.; Robert J. Marlow, '17, of New York; Burt R. Rickards, '99, of Albany, N. Y.; and Carl J. Trauerman, '07, of Butte, Mont.

Ballots are due back in the Alumni Office by April 20. Announcement of the result of the voting will be made soon thereafter. Since only one nomination is made for each Alumni Association office, only the Corporation nominees listed on the next page are contingent upon the balloting.

Reunion High Lights

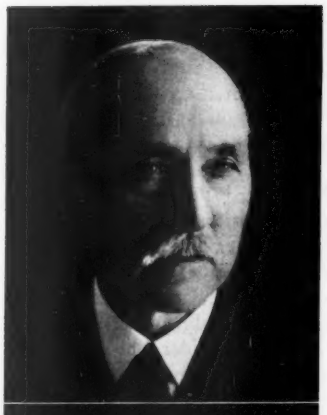
NEWS that President Stratton is to become Chairman of the Institute's Corporation and that Dr. Compton will fill the presidential vacancy gives an added importance to the All-Technology Reunion on June 6 and 7. Doubtless there will be formal ceremonies honoring both Drs. Stratton and Compton, and the Alumni will have the opportunity of seeing and meeting the Institute's forthcoming President.

A blanket price of $10.00 covering all Reunion events has been definitely settled upon by the Reunion Executive Committee. This is the lowest price that it has ever been possible to offer for so many important events. It was made possible by the generosity of many Technology men who have contributed to a fund to support the Reunion.

As announced in the March *Reunion Bulletin*, reduced round trip railroad fares will be available to Technology men returning to the Reunion. All Alumni should consult the March *Bulletin* for information, schedules, and instructions for obtaining the reduced round trip fares. The Reunion Committee is anxious to emphasize the fact that all official Reunion events are open to ladies. A committee of women working in coöperation with the M.I.T. Women's Association is providing special features for entertaining the wives of all Technology men at the Reunion.

A still further development of Alumni Day is being undertaken in that Heads of different Departments are planning to arrange courses and departmental conferences to enable Alumni and Faculty to exchange views.

The Technology Review for May will be a special issue celebrating the oncoming Reunion and all Alumni who wish to obtain complete details about all aspects of the Reunion should obtain and carefully read that issue.



Corporation Nominees

NINE men each year are chosen by the Nominating Committee and presented to the constituency of the Alumni Association for it in turn to select three from the nine as candidates for Term Membership on the Corporation, legal governing body of the Institute. The Corporation, now largely composed of Alumni, invariably has accepted and welcomed these nominees. The group this spring from which the Association chooses the three who will take office for five years beginning July 1, is composed of the following:

Left, from top to bottom

GODFREY L. CABOT, '81
President, Godfrey L. Cabot, Inc., Boston

WILLIAM D. COOLIDGE, '96
Associate Director, Research Laboratory, General Electric Company, Schenectady, N. Y.

GEORGE A. PENNOCK, '99
Assistant Works Manager of the Hawthorne Works of the Western Electric Company, Inc., Chicago, Ill.

CHARLES E. SMITH, '00
Vice-President, New York, New Haven and Hartford Railroad Company, New Haven, Conn.

Bottom center

SELSKAR M. GUNN, '04
Vice-President of the Rockefeller Foundation, in charge of activities in Europe, Paris, France

Right from top to bottom

WILLIAM R. GREELEY, '02
Member of the firm of Kilham, Hopkins and Greeley, Architects Boston

REDFIELD PROCTOR, '02
President, Proctor Trust Company, Proctor, Vt.

WILLIAM D. B. MOTTER, JR., '05
Assistant to the Vice-President of the Chile Exploration Company of New York, New York

LAWRENCE ALLEN, '07
Industrial Engineer, United Shoe Machinery Corporation, Boston

Photographs of Messrs. Cabot, Smith, Gunn, Greeley, and Motter; by Purdy, Underwood and Underwood (©), Bachrach, and Blank and Stoller, Inc., respectively.

The 144th Meeting

THE February meeting of the Alumni Council, after a dinner in the Faculty Dining Room of Walker Memorial was called to order at 7:45 by Harold B. Richmond, '14, presiding in the absence of the President. He introduced, as a salad orator, Thomas C. Desmond, '09, who spoke for eight minutes on the 1930 Reunion plans rehearsed on page 306.

The Secretary of the Association, Laurence P. Geer, '15, reported the election by the Executive Committee of 38 former students to Associate Membership in the Association. He also read the Treasurer's report which contained the following statement: "As of February 1, the Association's Operating Statement showed a Net Operating Surplus of $3,309.52 compared to $2,138.19 in 1929. Income from dues and income from Sustaining Memberships are greater than they have ever been in the history of the Alumni Association, and the increases will partly offset the extra expenditures incident to the June Reunion."

Secretary Geer also summarized the report of The Review Editors as follows: "Dues collected up to February 21, 1930, totalled 7,490 as compared with last year's final total of 7,324. Between now and June 30 next approximately 175 other dues payments may be expected."

James D. Brennan, former Treasurer of the University Club of Boston and Vice-President of the First National Bank, spoke briefly about the University Club and its new President, Walter Humphreys, '97. Mr. Brennan also discussed the need of keeping Alumni interested in their colleges. The Council voted to write a letter to Mr. Humphreys expressing the gratitude of the Council in his election as President of the University Club and wishing him success in his work.

Mr. Richmond ordered held over until the March meeting a report of the Committee on the election of Term Members to the Corporation.

A proposal for a standard design for Technology class rings was presented by John F. Bennett, '30, President of the Institute Committee, who stated that this design had been made up by a committee which contained representatives of each of the undergraduate classes. The Council voted that the design be approved as a standard design for Institute class rings.

The chairman then introduced Professor Donald C. Stockbarger, '19, who talked on ultraviolet light or "the tin can tan." He pointed out that commercial sun lamps varied greatly in their characteristics, that a number of them were incorrectly advertised and that their physiological effects were not thoroughly understood. Dr. Stockbarger's remarks evoked considerable discussion. Professor Erwin H. Schell, '12, was next introduced and spoke on the subject "Are Engineers Managers?" which was illustrated by lantern slides. Professor Schell also provoked general discussion, particularly on the value of the type of course represented by Course XV at the Institute.

The meeting adjourned at 9:45 P.M. There were 55 members and guests present.

Between the time that this is written and the appearance of The Review in the mails, another Alumni Council meeting will have been held. In accordance with the old and happy custom it will revive the combined Faculty and Alumni Council assemblage, the program including a presentation of the plans for enlarging Walker Memorial. These plans inspired by the work of a committee of undergraduates are to be presented by Harry J. Carlson, '92. A complete description of them, together with drawings, will be presented in the May issue of The Technology Review. Dr. Allen Winter Rowe, '01, is to present a report to this committee on a new method for Term Membership selection, which report includes suggestions for a general reorganization of the administration of the Alumni Association. Mr. Desmond is to present further Reunion plans.

PRESIDENT STRATTON WITH 25 STUDENTS IN THE DEPARTMENT OF ENGINEERING ADMINISTRATION WHO ARE CARRYING ON BUSINESS RESEARCH FOR THE NEW ENGLAND COUNCIL. PROFESSOR ERWIN H. SCHELL, '12, PROFESSOR OF BUSINESS MANAGEMENT, IS IN CHARGE

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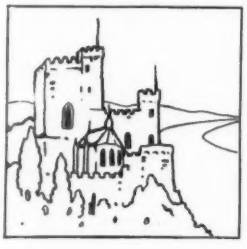

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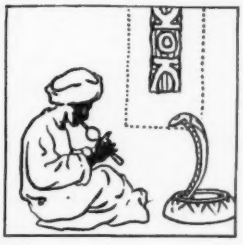

To JAPAN

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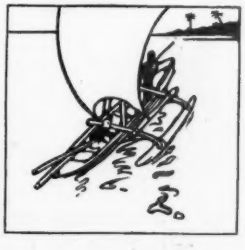

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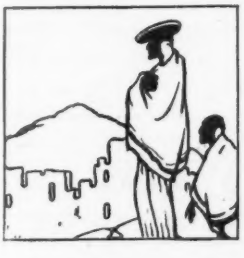

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SAILING AROUND NIAGARA

(*Continued from page 287*)

rence still barred the way to the sea. Steps to improve this section of the waterway had already been taken in 1821, three years before the Welland Canal was started, but the plan provided only for a canal around the famous Lachine Rapids just above Montreal. This work was completed in 1825, opening a way for vessels to proceed from the deep water of the St. Lawrence into Lake St. Louis. The task of circumnavigating the remaining rapids was carried on for more than 20 years.

In 1848 the last canal was completed and that far-reaching waterway from the Great Lakes to the Atlantic, the vision of generations of merchants and navigators, became a reality. That these early artificial links in the Great Lakes-St. Lawrence route permitted the transit of only small vessels in nowise discounts the significance of the achievement as an engineering work of great magnitude in its day.

The series of canals which carry shipping around the St. Lawrence Rapids include the famous old Beauharnois Canal, now replaced by the Soulanges Canal, which lifts ships above the Cascades, Cedar and Coteau Rapids between Lake St. Louis and Lake St. Francis. It is 14 miles long and is the most modern of the group. Others are the Cornwall Canal, a cut of 11 miles round the white turbulence of the famous Long Sault Rapids. Then come the Farran's Point and Rapide Plat Canals. With the growth of shipping on the Great Lakes it became necessary to enlarge and deepen these canals, all of which in 1901 were brought to a uniform limiting draft of 14 feet. No sooner had the work been completed than it became apparent that the improved waterway was quite inadequate for the demands of the immediate future.

The original Welland Canal was built via the Twelve Mile Creek from Port Dalhousie, on Lake Ontario, to Port Robinson on the Chippewa Creek. At Port Robinson, vessels descended the creek to the Niagara River, and thence to Lake Erie. It had 40 wooden locks, each 110 feet long, 22 feet wide, with 8 feet depth of water on the sills. It was connected by a feeder canal to the Grand River at Dunnville and later was extended from Port Robinson to Port Colborne on Lake Erie. This section was opened to navigation in 1833, and was located on what is now the site of the present canal between Port Colborne and Allanburg, the summit level. The canal was 27.5 miles long from lake to lake. (*Continued on page 312*)

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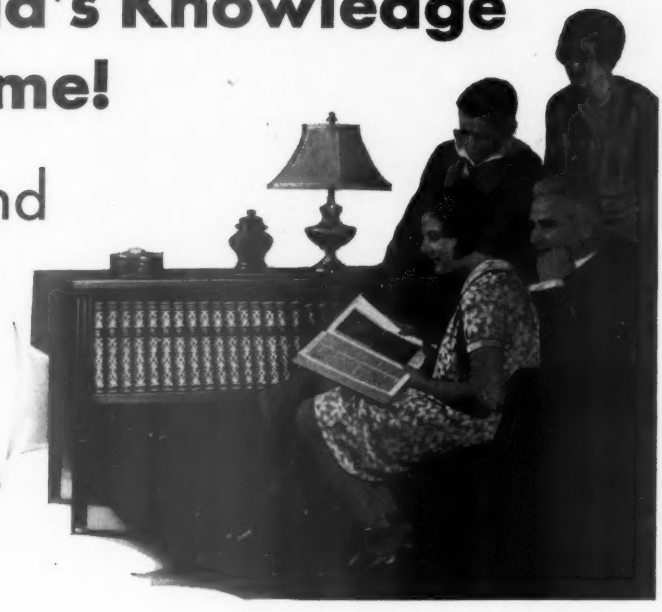

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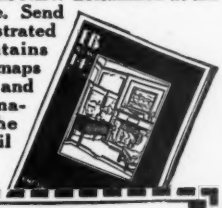

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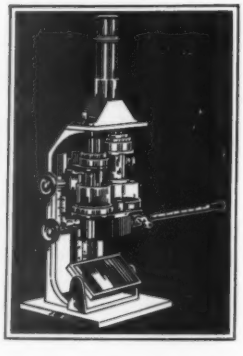

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SAILING AROUND NIAGARA

(Continued from page 310)

In 1841, the Legislature of Upper Canada (now Ontario) purchased the canal and decided to increase the depth to 9 feet, and to complete the St. Lawrence Canals. The Port Maitland-Dunnville branch was built at that time, and this route, or second canal, was opened to traffic in 1845. In 1853 the navigable depth was increased to 10 feet by raising the banks and the walls of the locks, but it was not until 1881 that the canal was fed from Lake Erie at Port Colborne. That portion of the second or old canal, as it is now called, between Allanburg and Port Dalhousie, ceased to be used for navigation about 1890.

Twenty-two years after Upper and Lower Canada had completed 9-foot navigation between Lake Erie and Montreal, the Dominion Government took up the question of inland navigation, and the Commission of 1870 recommended a uniform scale of navigation for the St. Lawrence route and the Welland Canal, with locks 270 feet long, 45 feet wide with 12 feet of water on the sills. This depth was later increased to 14 feet. The present canal leaves Lake Ontario at Port Dalhousie and climbs the escarpment east of the second or old canal, to Allanburg. From the latter place to Port Colborne it follows the route of the second canal. Its locks are built of hand-cut stone, with lifts of 12 to 14 feet. It is carried over Chippewa Creek in a cut stone aqueduct. This third canal, 26.75 miles long, was opened to traffic for 14-foot navigation in 1887, and the St. Lawrence River Canals in 1901, when the Northwestern Steamship Company of Chicago placed a fleet of 4 steamers of 2,000 tons capacity in commission between Chicago and Europe. The present canal up to March, 1928, cost, for capital construction and permanent improvements, $33,322,061.64 and $13,815,-859.20 for repairs and maintenance. These amounts include the cost and maintenance of the 3,000,000-bushel grain elevator at Port Colborne. The St. Lawrence and Welland Canals between Lake Erie and Montreal cost Canada, up to March, 1928, $82,675,084.34 on capital construction and permanent improvements, and $31,989,-925.14 for repairs and maintenance. The cost of the new Welland Ship Canal is expected to be approximately $115,000,000.

IN 1901 the total tonnage passing through the Welland Canal was only about 620,000 tons. In 1914, it had increased to 3,860,000 tons, indicating that since the completion of the 14-foot navigation system in 1901, the St. Lawrence route had drawn more heavily, year by year, upon the Great Lakes-Atlantic seaboard trade. As a result of the World War, when many lake vessels went into service on the high seas, traffic through the Welland Canal fell off from 3,860,000 tons in 1914, to 2,200,000 tons in 1918–1919. Since then, however, traffic has been growing rapidly, with a new maximum annual tonnage record of 7,247,459 tons, established in 1927. This notable increase in tonnage through the comparatively shallow present Welland Canal in the last 6 years gives some indication of what may be expected in the development of traffic when the new canal opens a passage to Lake Ontario and the upper St. Lawrence for the fleet that never before has passed below Lake Erie. *(Continued on page 314)*

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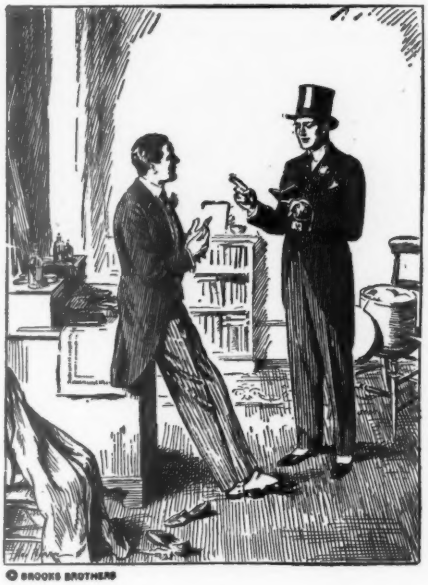

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The TECHNOLOGY REVIEW
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SAILING AROUND NIAGARA

(*Continued from page 312*)

A rising tide of commerce on this route recalls the early history of the Erie Canal system and its great influence upon the development of the Empire state. The New York State Barge Canal, which clothes the historic skeleton of the Erie waterway, leaves Lake Erie near Buffalo and wanders northeastward across New York, utilizing a series of lakes and streams in its course of more than 300 miles to the headwaters of the Hudson River at Troy. It has a limiting depth of 12 feet and its locks are 300 feet long and 44.5 feet wide.

Comparison of distances over the St. Lawrence route and the New York Barge Canal reveals that from Buffalo to Liverpool via the St. Lawrence, the distance is 3,156 miles, or 374 miles shorter than the Empire State Canal route by way of the Hudson and the Port of New York.

The history of early exploration and trade on the Great Lakes chronicles the fact that the waterways south of what is now Chicago were trails of commerce between Lake Michigan and the Mississippi River country. The Illinois Canal which now permits the passage of shallow draft barges from Chicago to the Mississippi by way of the Illinois River, literally grew out of Chicago's solution of the problem of sewerage disposal. In developing the Chicago drainage canal system to carry the city's enormous waste away from the city's water supply in Lake Michigan, the flow of the Chicago River was reversed and it now carries the sewerage of Chicago southward to the Mississippi. While this waterway holds no lure as a path for pleasure craft, it is being used to a limited degree for barges drawing not more than 7 feet of water. As an outlet for distributing the goods of the Middle West southward along the Mississippi Valley the Illinois Canal has valuable potential possibilities. The question of increasing its depth to 9 feet is under consideration, but there is little likelihood that this waterway could ever be employed for large vessels. Aside from the vast undertaking of enlargement, the problem of maintaining deep channels in the Mississippi, which annually deposits 406,250,000 tons of silt in the Gulf of Mexico, still awaits solution.

In contrast to many rivers, the St. Lawrence flows deep and clear blue throughout its length and offers none of the problems of constant channel maintenance. Improvement of the St. Lawrence Canals to such dimensions as would permit the passage of ships drawing at least 25 feet, has been contemplated for many years. This involves reconstruction of a section comprising less than 50 miles in a deep waterway stretching 4,529 miles from Duluth, on Lake Superior, to Liverpool. During the past quarter of a century exhaustive surveys have been made to determine the feasibility and cost (*Concluded on page 316*)

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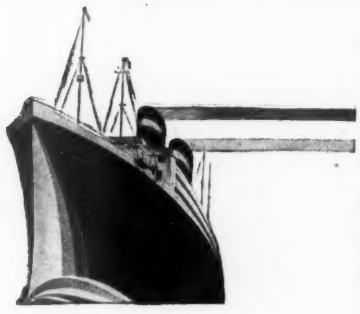

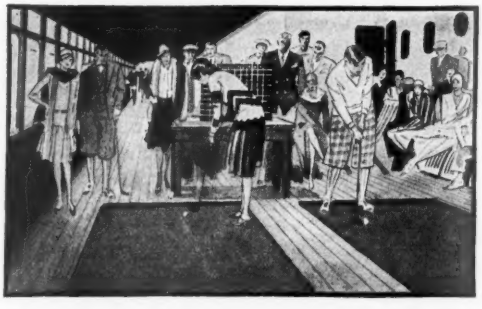

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SAILING AROUND NIAGARA

(Concluded from page 314)

of the improvements, and another has recently been undertaken by the International Joint Commission representing Canada and the United States.

Speaking last year at the celebration which marked completion of 9-foot navigation on the Ohio River from Pittsburgh, Penna., to Cairo, Ill., President Hoover emphasized the urgent need for further development of the continental waterways. Of the Great Lakes-St. Lawrence system he said: "One of the most vital improvements to transportation on the North American Continent is the removal of the obstacles in the St. Lawrence River to ocean-going vessels inward to the Great Lakes. Our nation should undertake to do its part whenever our Canadian friends have overcome those difficulties which lie in the path of their making similar undertakings." He estimated that after disposal of the electric power, the entire construction of the St. Lawrence River projects could be contracted for far less than $200,000,000, divided between the two governments, and spread over a period of 10 years.

Completion of the Welland Ship Canal this summer cannot help but arouse new interest in plans for carrying out the remaining improvements in this great natural highway. When that is done the vision of great ships carrying the products of a vast inland empire of industry and agriculture to the ports of the Seven Seas will have been fulfilled in the ultimate destiny of the St. Lawrence River.

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(Continued from page 290)

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CITIES FIT TO LIVE IN

(Continued from page 293)

2. What perhaps is more important and more difficult is the support of public opinion. Here no one can predict.

3. Action can only be based upon official approval. This seems far off. City governments are conservative.

4. In this country, at least, new legal powers would have to be secured. Progress in such matters is slow.

But much can be done of a less downright character. The essence of many of these ideas can be applied from time to time, as opportunities occur. And then, in all of our big cities there are "blighted districts" that should be demolished and reconstructed. Sections of Paris, London, and Berlin, of New York, Chicago, and Boston, await action. The first demonstration will most likely come in Europe, especially in continental Europe — but who knows? A city like New York, "dying of greatness," may suddenly move in this as in other great enterprises, and lead the world.

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CITIES FIT TO LIVE IN

(Concluded from page 320)

however, is notable, and is well evidenced in a recent volume entitled "Our Cities Today and Tomorrow," by Theodora Kimball Hubbard and Henry Vincent Hubbard, which is reviewed in this issue.

But city planning, even in its merely physical aspects, is more than buildings, open spaces and streets. It is a complex, baffling problem in broad design, calling for the logical distribution of all the essential features of a modern city and its environs, and a reduction of all the parts into a unified whole. City planning is a recognition of the wide relationship of the bulk of buildings, the amount of open space, and the location and width of streets. It cannot break sharply with the past. It cannot ignore the present. It cannot for one moment forget that a city is not like any single structure, no matter how great that structure may be. A city is an organism, a growth, and cannot be put into a strait-jacket, even if such action might make for greater efficiency, for health, for prosperity, for public welfare, for life itself.

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Is Le Corbusier one more dreamer, or is he a prophet? Are his plans, ideas, and program chimerical? Is "the city a machine for working in?" Is his scheme "brutal," as he says, because city life itself is brutal? Or does he point to a better way to rebuilding our great cities to meet the imperative requirements of our own century and those that are to follow?

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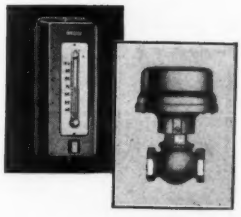

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THE TABULAR VIEW

IN AN ESSAY, "The Mucker Pose," published a year or so ago in *Harper's*, JAMES TRUSLOW ADAMS anticipated in a more sober manner, if he did not inspire, PROFESSOR ROGERS's innocent divertissement upon being a snob. The manner in which that article was written revealed that Dr. Adams not only is an able historian but also an astute critic of American life. An examination of his career reveals his unique background for work in these two fields. He graduated from the Brooklyn Polytechnic Institute in 1898, received an A.M. from Yale in 1900, and subsequently became a member of the New York Stock Exchange. An engineer turned broker is not uncommon but an engineer turned historian is. The latter Dr. Adams accomplished successfully, and by 1922 he had captured the Pulitzer Prize of $2000 for the best book on the history of the United States written during the previous year ("The Founding of New England"). Between 1912 and 1922 he had participated in the World War in the capacity of Captain in the Military Intelligence Division, General Staff, United States Army. Early in the War he was with Colonel House's commission to prepare data for the Peace Conference. ¶ Aside from his Pulitzer Prize book, he has written "Revolutionary New England 1691–1776," "New England in the Republic (1776–1850)," "Provincial Society (1690–1763)," and "Our Business Civilization," the latter book containing the article mentioned above. Despite all of these various achievements, Dr. Adams has kept in touch with modern developments in science, particularly physics, and he recently contributed an able article to *The Yale Review* on Henry Adams and the new physics. The Review is very happy to present a sequel to that article discussing at greater length the application of the scientific method to the study of history.

WALDEMAR LINDGREN, who has achieved eminence in America as an economic geologist, was born in Kalmar, Sweden in 1860. He received his education in his native country but came early to America to join the United States Geological Survey for which eventually he became chief geologist in 1911. In 1912 he came to Technology as William Barton Rogers Professor of Geology, having lectured here since 1908. From 1912 to 1920 he was in charge of the Department of Geology, from 1920 to 1926 of the combined Departments of Mining, Metallurgy, and Geology, and since 1927 of the now distinct Department of Geology. He is the author of the authoritative work, "Mineral Deposits," and innumerable reports on mining geology. During his long residence in the United States he has not forgotten his native land and his article on page 345 demonstrates this continued interest. It is particularly valuable because of Dr. Lindgren's detached position and of the comparisons which his American experience enables him to draw.

HENRY M. PROPPER, who collaborated with THOMAS C. DESMOND, '09, in the preparation of the article on Radburn, N. J., is an official of the City Housing Corporation which has built this unique

(*Continued on page 334*)

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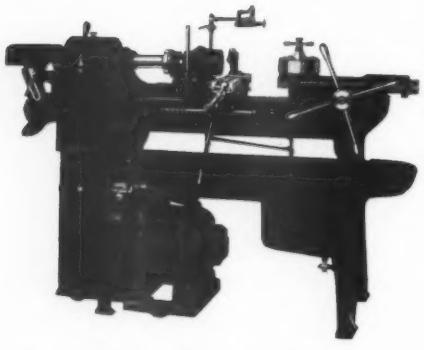

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THE TABULAR VIEW

(*Continued from page 332*)

city. Mr. Desmond, through his manifold activities in behalf of the Institute, his engineering firm in New York, and his activity in Republican politics, is well-known to Review readers. Messrs. Propper and Desmond's article was prepared at the request of The Review Editors as one in a series which is being published on city planning, its needs, its philosophy, and its achievements. ¶ J. Rhyne Killian, Jr., '26, is Managing Editor of The Review.

THE PHOTOGRAPHS on pages 340, 348, and 349 are the work of Miss Margaret Bourke-White of Cleveland, Ohio. With a camera technique hardly equalled in America, she has brought to the photography of industrial subjects a precipient artistic sense which has quickly brought her renown. It is a pleasure to present her work along with the other fine illustrative material which The Review has been running on scientific and engineering subjects. ¶ Jacques Carlu, *Maestro* of the Institute's Department of Architecture, executed the water color reproduced on the cover of this issue. He was born in Paris, France, in 1890, and in 1919 won an A.D.G. from the *École des Beaux Arts*. His water color, reproduced on the cover of the November issue of The Review was received with such approbation, that The Review is fortunate again to present his work.

SEVERAL COMMENTS have come in on A. W. K. Billings's ['28] article, "Modernistic Architecture," published in the February issue. An extensive criticism from Shepard Vogelgesang, '26, is excerpted below, with the regret that it cannot be published in full. "Possibly it is unfair to consider that all of the most modern European architecture stands condemned in the February issue of The Technology Review. Much of the text stated architectural principles and problems clearly. The choice of photographs seems somewhat malicious, and there are a few additional principles underlying modern European design which might be stated. So far as possible, any work should be thoroughly understood before it is condemned. The most just condemnation comes from comprehension of the aims of the work and detection of its failure. When Le Corbusier builds a *machine à habiter* which is uninhabitable and Gropius erects a school in which teaching is impossible, there is ground for criticism of their intelligence. When the buildings appear shoddily built the architect's economics are at fault. If they are displeasing in proportion, then the artist is accountable. Good proportion is in addition a matter of intelligence. Granted iron as a column material, would the supports of the roof slab in. . . . Les Terraces be more satisfactory five times their diameter?

"This question arrives at one of the points of departure from academic design made by modern architecture. The architect who employs the traditional mode surrounds his iron column with a stone column or pier.

(*Concluded on page 336*)

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THE TABULAR VIEW

(Concluded from page 334)

The modern architect recognizes that the function of this apparently stone column is performed by the iron within. He takes the working member, considers its relation to other materials traditional and untraditional in the surrounding building and creates for it a proportion emblematic of its substance. To persons reared on the stone conception of a column the result is shocking. Once the intellectual adjustment is made to a new material, then one can judge of its aesthetic sufficiency to its surroundings. . . .

"It is undeniable that the result, no matter how true to the material or how good a working solution to the problem, may be ugly. So are many buildings independent of the functional conceptions of the moderns. Neither traditionalism or modernism is a panacea for beauty. Beauty is a personal expression of the artistic feeling of the architect. It is the record, in a sense, of his adjustment to his environment and is the flowering of the life about him. Beauty is a thing felt and usually makes nonsense when written about. Ideas can be written about, but feelings become ideas when expressed. One must be generous enough to admit the possibility of achieving beauty in any manner. . . . Only when the horror of seeing concrete cantilever and steel look wiry and the awful knowledge that St. Peter's dome is held in by a belt of chains is overcome, can one nowadays become absorbed in the aesthetic aspect of building.

"There are ideas other than . . . the functional expression of substance back of the modern movement . . . It is best represented by shoe store architecture in the United States, soon to be eclipsed, however, at least in magnitude by the completion of the Chrysler Building. It is this modernistic design in the United States and France which points to good sense on the part of much of Europe in discarding decoration as a mode of modern expression. . . .

"It was the violence done materials by machine which started some of the modern striving to find ways of avoiding the appearance of torture either by returning to craftsmanship or by seeking methods of work wherein the material and the machine agreed. . . . Picturesque results of the machine age are the fantastic activity of man to consume articles put out by the machine and the frenzied adoption of new means of locomotion and communication. These are the features of modern life which man has been able to romanticize successfully. Can likewise the romanticism of American building with scores of stories in the sky, Greek temples, flashing spears, spreading wings, gilded howdahs, calliope pipes, chromatic sunbursts, Renaissance domes, Gothic flêches, water coolers, coronets, chateaux roofs, lotus blossoms, lightning brandishers be conceded romantic success? The eccentricity of European architects grows somewhat pale before such a literal enumeration of the beauties conjured by supposedly conservative architects against the New York sky. If one name a single, recent important building in New York unmarked by such eccentricities it must be the Daily News by Raymond Hood '03. . . ."